DISSERTATION

USING PERCEIVED NORMS TO PREDICT HEAVY ALCOHOL USE AMONG COLLEGE STUDENTS: IMPLICATIONS FOR SOCIAL NORMS MARKETING CAMPAIGNS

Submitted by

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ABSTRACT

USING PERCEIVED NORMS TO PREDICT HEAVY ALCOHOL USE AMONG COLLEGE STUDENTS: IMPLICATIONS FOR SOCIAL NORMS MARKETING CAMPAIGNS

The purpose of the present study was to investigate the relationship between perceived norms of heavy peer alcohol use and self-reported heavy alcohol use among college students from a large public university. A total of 865 participants completed a survey in Fall 2008 and 506 of those participants completed the follow-up survey in Spring 2009. As hypothesized, the perceived injunctive norm was found to predict additional unique variance in heavy alcohol use above and beyond gender, year in school, residence hall, retrospective high school alcohol use and the perceived descriptive norm. The interaction between the perceived injunctive norm and perceived descriptive norm was not significant in the prediction of heavy alcohol use, as hypothesized. This suggests that the combined effect of the perceived injunctive norm and perceived descriptive norm in predicting heavy alcohol use is additive and not multiplicative. In a secondary hypothesis, the relationship between the perceived descriptive norm and heavy alcohol use was stronger for males than females. Lastly, as predicted, the results revealed that the relationship between perceived norms of heavy alcohol use and self-reported heavy alcohol use are stronger among more proximal than distal groups. These results suggest that social norms marketing campaigns aimed at reducing heavy alcohol use among college students should include the injunctive norm, target males, and use more proximal reference groups such as the student's own residence hall rather than more distal reference groups such as the typical university student.

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CHAPTER I

THEORY OF PERCEIVED NORMS AND BEHAVIOR

Norms and College Alcohol Use

The misuse of alcohol among college students is a focal point of college culture and dates back to European Universities during the Middle Ages (Boyd, McCabe, & Morales, 2005). Unfortunately, many negative consequences are experienced as a result of alcohol use, such as decreased academic performance (Lo & Globetti, 1995), class absences (Carson, Barling, & Turner, 2007), memory loss (Goodwin, 1989) and damage to property (Wechsler, Lee, Gledhill-Hoyt, & Nelson, 2000). More specifically, heavy episodic-drinking, which is five or more drinks in a drinking occasion for men and four for women, has been found to be associated with unintentional injuries, intentional injuries, sexually transmitted diseases, alcohol poisoning (CDC, 2009), alcohol dependence (Baer, Kivlahan, & Marlatt, 1995), motor vehicle death, non-motor vehicle death (Hingson, Heeren, Winter & Wechsler, 2005), sexual assault and other illicit drug use (Boyd et al., 2005).

Previous research has documented that perceived norms explain a large amount of variance in predicting college alcohol use (Borsari & Carey, 2003). Drinking alcohol in college is considered to be a social behavior, so it is not surprising that students' perceptions of peer alcohol use are strongly correlated with self-reported alcohol use. Similarly, the relationship between the perceived norm and negative consequences from alcohol use is stronger among college students who score high on social comparison orientation in comparison to those who score low on social comparison orientation (Litt, Lewis, Stahlbrandt, Firth, & Neighbors, 2012).

This relationship between normative perceptions and alcohol use has inspired the use of social norms campaigns to reduce alcohol use on college campuses across the country.

Social norms marketing campaigns aim to reduce the number of heavy episodic drinking episodes by advertising low quantities per event, "*Most students drink 4 or less when they party.*" Unfortunately, when alcohol use is studied in college samples, it is most commonly measured with quantity x frequency measures (Greenfield & Kerr, 2008; McGinley & Curran, 2014). Of the quantity x frequency measures, weekly drinking is the most common which is represented in the Daily Drinking Questionnaire (Collins et al., 1985). Despite the popularity of weekly drinking measures, researchers are concerned about their validity (Greenfield & Kerr, 2008; McGinley & Curran, 2014). For example, a weekly drinking measure cannot identify heavy episodic drinking. A score of 14 drinks for the week can occur in two very different types of drinking patters. A person could consume two drinks a day spread out over seven days for a total of 14 drinks with no heavy episodic drinking episodes. Another person could drink seven drinks on Friday night and seven drinks on Saturday night for a total of 14 drinks, which consists of two heavy episodic drinking episodes. Because the most popular college alcohol use measures are based on weekly drinking patterns (Greenfield & Kerr, 2008; McGinley & Curran, 2014) social norms marketing campaigns have very little research to guide their campaigns. The results of the present study are based on the creation of a three item alcohol use composite score called heavy alcohol use. One of the three items in the heavy alcohol use score is an item measuring frequency of heavy episodic drinking. The present study attempts to provide meaningful results to guide future social norms marketing campaigns by filling the gap of literature on college alcohol use that uses heavy alcohol use as the dependent variable.

Norms and General Behavior

Sherif (1935) is considered to be the first study to investigate the relationship between a perceived norm and behavior. Conformity occurs when someone changes their behavior to be consistent with the perceived behavior of others. Sherif asked participants to estimate how far a beam of light on a wall moved. The beam of light never moved, but had the appearance of movement due to the autokinetic effect. The results showed that when participants were tested in a room by themselves, estimates varied considerably from person to person. However, when participants were tested in the presence of others, the estimates across different participants became very similar. Sherif described this pattern of responses to reflect participants sharing points of reference for how far the beam of light appeared to move. After testing participants in groups, Sherif tested the participants once again, individually. Interestingly, even though participants were not in the presence of others, their shared points of reference acquired in the group testing carried over into subsequent trials of individual testing. Results suggest that participants were influenced by informational social influence which is changing your behavior to be consistent with others due to one's desire to be correct.

Asch (1956) expanded on the work done by Sherif (1935) with the addition of confederates in a similar experimental paradigm. Asch (1956) placed a group of seven to nine confederates to publicly announce their answer to the experimental question in the presence of one naïve participant. Participants were shown a picture of a standard line and three comparison lines. Participants were asked to pick the comparison line that was the same length as the standard line. In 12 of the 18 trials, all confederates unanimously gave an incorrect answer. Results showed that the naïve participants gave an incorrect answer on 40.0% of the trials in which an incorrect answer was unanimously given by the confederates. This was in comparison to 1% of incorrect answers when correct answers were given unanimously by the confederates.

In addition, 76.0% of the participants gave at least one incorrect answer during the 12 trials in which an incorrect answer was unanimously given by the confederates.

Deutch and Gerrard (1955) made the important distinction between normative social influence and informational social influence. Informational social influence was defined as participants conforming to the behavior of others in an attempt to make correct estimations about their environment. Participants in Sherif (1935) engaged in conformity when tested individually and with no threat of social disapproval. As a result, this is an example of informational social influence. Participants simply wanted to be correct about the distance the beam of light appeared to move. The error rates of participants in Asch (1956) dropped from 40% to 12.5% once they were able to answer questions anonymously on a sheet of paper and did not fear public disapproval. This suggests that they were mostly influenced by normative social influence. Participants gave incorrect answers in an attempt to fit in with the group. It was concluded that participants where influenced by normative social influence, which is changing one's behavior to be consistent with the group due to a desire to fit in with the group.

MacNeil and Sherif (1976) conducted a similar study to Sherif (1935) with the addition of acting confederates. The experiment began with one naïve participant and three confederates estimating the autokinetic effect. The confederates overestimated the length of a beam of light for 30 trials. At the end of each 30 trial segment, one of the confederates was replaced by another naïve participant and was considered to be one generation. At the fourth generation, a naïve participant replaced the last existing confederate, resulting in all naïve participants in the group. The experiment continued for a total of 11 generations. The results showed that the overestimations displayed by acting confederates in the first four generations continued to influence future estimations even when acting confederates were no longer physically present

after the third generation. The lasting effects of normative social influence can sometimes outlast the physical presence of the group. When trying to change overestimations of college alcohol use, attitudes and behaviors from previous college students who are no longer physically on campus may still be influential. As a result, it is suggested that changing norms and behavior takes time, often consisting of multiple years or "generations" of college students.

Focus Theory of Normative Conduct

An important theoretical advancement in the relationship between perceived norms and behavior is the Focus Theory of Normative Conduct (FTNC; Cialdini, Kallgren, & Reno, 1991). The FTNC made an important distinction between a descriptive norm (what most people do) and an injunctive norm (what most people approve of). The FTNC also states that behavior is best predicted from norms when both norms are aligned. For example, if a peer group of college students drink alcohol (descriptive norm) and approve of drinking alcohol (injunctive norm) both norms are aligned and the participant will be more likely to drink alcohol than if a peer group of college students drink alcohol, but do not approve of it. Misaligned norms send a mixed message and are less likely to change behavior than aligned norms with a consistent message. The second important aspect of the FTNC is that norms need to be salient to be influential. We only change our behavior to be consistent with the norms that we notice.

Norm salience. The importance of norm salience was demonstrated in the classic parking garage study conducted by Cialdini et al. (1991). As participants walked from a parking garage elevator to their car, they passed a confederate who either littered a handbill on the ground or just walked by the participant, which served as the first independent variable. The second independent variable was whether the parking garage was littered or clean. Once participants got to their car, there was a handbill on their windshield. The dependent variable was whether the

participant littered the handbill or not. The results showed that in the littered environment, participants were more likely to litter when they passed a confederate who littered than a confederate who just walked by the participant. However, the results were the opposite for the clean environment. In the clean environment, participants were less likely to litter when they saw the confederate litter than a confederate who just walked by the participant.

Results from Cialdini et al. (1991) are very interesting because they are somewhat inconsistent with observational learning within the context of social learning theory (Bandura, 1977). If a participant witnesses someone litter, why would they be less likely to litter? The answer lies within norms and norm salience. The act of littering draws the participant's attention to the environment, making the norm for the environment salient. If the environment is clean, the act of littering by the confederate draws the participant's attention to the fact that most people do not litter here. If the environment is littered, the act of littering by the confederate draws the participant's attention to the fact that most people do litter here. In conclusion, the act of littering by a confederate can influence the littering behavior of others to increase or decrease dependent upon the environment being clean or littered.

When trying to predict college alcohol use, different types of perceived alcohol norms will be more or less salient to college students. Deviance Regulation Theory suggests that counter-normative behavior stands out and normative behavior blends into the perceptual ground (Blanton & Christie, 2003). This may be somewhat problematic for trying to reduce college alcohol use because a student may be more likely to remember the one very entertaining student on campus who was stumbling home drunk and many not recall the 100+ sober students from the night before. Additionally, students who have been drinking are going to be more likely to stand out with non-normative behavior due to lowered inhibitions from alcohol consumption.

Similarly, Lederman et al. (2004) made the argument that many students misperceive the norm for college alcohol use to be dangerously high due to students' selective attention: when students arrive on campus they are more likely to seek out information that is consistent with their current attitudes (i.e., overestimated alcohol used) which reinforces their normative misperceptions.

The potential impact of norm salience on college alcohol use was further demonstrated by Cho (2006a) who reported that the association between the perceived friends' descriptive norm and drinking behavior was strongest among frequent binge drinkers r=.66, followed by occasional binge drinkers r=.53 and non-binge drinkers r=.41. Drinking behavior could be an indicator of norm salience. If you are a frequent binge drinker, the norm for drinking may be more salient for you than a light drinker or non-drinker because you are engaging in the behavior more often. Alcohol use norms could also be more salient by spending more time with alcohol using peers.

Yanovitzky et al. (2006) reported that the relationship between perceptions of friend alcohol use and self-reported alcohol use is slightly stronger among those who frequently spend time with alcohol using peers compared to those who infrequently spend time with alcohol using peers. The perceived norm for alcohol use may be more salient for someone who spends more time with an alcohol using peer possibly because there is more time to discuss alcohol use, which would be consistent with the moderating role of peer communication suggested by Real and Rimal (2007). Real and Rimal (2007) reported that the relationship between the perceived descriptive norm and alcohol use intentions was stronger for participants who reported a high level of peer communication. Someone who has a high level of communication with friends could possibly be more confident about their perceived descriptive norm for alcohol use among their peer group in comparison to someone who has a low level of communication with friends.

Neighbors, Lindgren, Knee, Fossos, and DiBello (2011) reported that the relationship between the perceived injunctive norm and self-reported alcohol use was stronger among students who felt more confident about their estimates of the perceived injunctive norm.

Perceived descriptive norm. The descriptive norm is defined as what most others to do (Cialdini et al., 1991). The descriptive norm in the Asch study (1956) was clearly illustrated to the participants by what other participants (confederates) said to the researcher. However, when considering the alcohol use of peers, what is used to predict alcohol use is in fact the perceived descriptive norm. The perceived descriptive norm of peer alcohol use has been consistently found to be positively correlated with self-reported alcohol use among college students (Cho, 2006b; LaBrie, Hummer, Neighbors, 2008; Lee, Geisner, Lewis, Neighbors & Larimer, 2007; Real & Rimal, 2007). In fact, among a sample of student athletes across 15 Universities, Perkins and Craig (2012) reported that the perceived descriptive norm of males was more predictive of self-reported alcohol use r=.65 than the actual descriptive norm of males r=.24. This illustrates that self-reported alcohol use is more strongly correlated with perception than reality. As a result, the perceived descriptive norm has been the focal point of most social norms marketing campaigns aimed to reduce college alcohol use.

Most social norms marketing campaigns focus on the number of drinks consumed when a student is in a drinking situation. The most common social norms marketing statement is, "_____% of students consume 0-4 drinks when they party" with the percentage being over 50% to illustrate a majority of others that favors responsible drinking (Polonec, Major, & Atwood, 2006). It is suggested by the present study that the perceived descriptive norm is the focal point of social norms marketing campaigns because it is closely tied to observational learning within the context of social learning theory (Bandura, 1977). College students observe other students

consuming alcohol and are therefore influenced to also consume alcohol (Phua, 2011). Many students overestimate the perceived descriptive norm and social norms marketing campaigns aim to reduce the perceived descriptive norm to a more accurate level by advertising the real descriptive norm on campus.

In addition, the perceived descriptive norm for friends' experiences with negative consequences has been found to be positively correlated with willingness to experience a negative consequence from alcohol use (Mallett, Varvil-Weld, Turrisi, & Read, 2011). This illustrates college students who perceive that their friends have experienced negative consequences from drinking are more willing to experience negative consequences from drinking themselves. While it is important to try to correct the perceived descriptive norm in social norms marketing campaigns, only including the perceived descriptive norm is not enough. Based on the FTNC described above, including the perceived descriptive norm and perceived injunctive norm will better predict and/or change behavior than including the descriptive norm only. While perceived norms have often been used to predict alcohol use, very little research exists in which perceived norms are the outcome. Thus, another aim of the present study is to contribute to our understanding of precursors to the perceived descriptive norm and perceived injunctive norm.

Perceived injunctive norm. The perceived injunctive norm is defined as a person's estimate of what most others approve of. Perceived peer approval of college alcohol use has been found to be positively correlated with self-reported alcohol use and alcohol-related negative consequences (Cho, 2006b; LaBrie, Hummer, Neighbors, & Larimer 2010; Lewis, Neighbors, Markman-Geisner, Lee, Kilmer, & Atkins, 2010; Mallett et al., 2011; Real & Rimal, 2007). Moreover, in an experimental design, half the participants in Prince and Carey (2010) were given

injunctive norm feedback stating, "Most students at SU actually agree that drinking to excess is unacceptable." Results showed that injunctive norm feedback was able to significantly reduce the perceived approval of alcohol use (injunctive norm) and perceived consumption level of alcohol use (descriptive norm) for the typical student. This result demonstrates that if you provide data on the injunctive norm, it has the ability to change the perceived injunctive norm as well as the perceived descriptive norm of the participant.

According to the FTNC, behavior is best predicted or changed when the injunctive norm and descriptive norm are in agreement. However, if the two variables are not in agreement, which is more powerful in predicting behavior? The perceived descriptive norm has been consistently shown to be more strongly correlated with college alcohol use than the perceived injunctive norm (Cho, 2006b; LaBrie et al., 2008; Rimal & Real, 2007). One possible reason for this effect could be that most college alcohol use research is cross-sectional. In a cross-sectional analysis, Larimer, Turner, Mallett, and Geisner (2004) showed that the perceived descriptive norm was a better predictor of baseline drinking than the perceived injunctive norm. However, when predicting future drinking behavior one year later, the perceived injunctive norm was a better predictor than the perceived descriptive norm. It was suggested that the perceived injunctive norm may be more closely tied to group identity (light drinker, heavy drinker, or abstainer) which may take longer to change than the perceived descriptive norm.

Measurement issues are another possibility as to why the perceived descriptive norm has been a better predictor of self-reported alcohol use than the perceived injunctive norm. Self-reported alcohol use, "*How much do you drink?*" and the perceived descriptive norm, "*How much do you think others drink?*" are very similar. However, the wording of the perceived

injunctive norm is different because it focuses on approval of college alcohol use, "*What percentage of students at your college approve of alcohol use?*"

A third possible reason for self-reported alcohol use being more strongly correlated with the perceived descriptive norm than with the perceived injunctive norm could be restriction of range in the perceived injunctive norm. This restriction of range may be a genuine phenomenon (i.e., a common belief that alcohol use in college is approved of) resulting from the strong cultural stereotype of the college lifestyle of frequent heavy alcohol use and scarce academic activities held within our culture (DeJong, 2010; Martens, Page, et al., 2006). Alternatively, the restriction of range could be a measurement issue (i.e., the scales for the perceived descriptive norm are often larger than the scales for the perceived injunctive norm). Results from the control group in Prince and Carey (2010) show the perceived descriptive norm for students at Syracuse University to be 9.25 (*SD*=2.93) on a one to 25 point scale resulting in a coefficient of variation of 31.67. In contrast, the perceived injunctive norm for students at Syracuse University was 4.80 (*SD*=1.08) on a 1-6 point scale, resulting in a coefficient of variation of 22.5. Similar results were reported by Lee et al. (2007): perceived descriptive norm of 10.51 (*SD*=11.12) with no scale, resulting in a coefficient of variation of 105.8 versus the perceived injunctive norm of 2.19 (*SD*=.94) on a one to seven point scale, resulting in a coefficient of variation of 42.92. Whether it is due to measurement issues or true variability in the constructs themselves, clearly these data show that there is more variability in the perceived alcohol use of others (perceived descriptive norm) than the perceived approval of alcohol use of others (perceived injunctive norm).

In conclusion, when looking at cross-sectional data the perceived descriptive norm has been shown to be a better predictor of college alcohol use than the perceived injunctive norm. However, previous studies have been subject to a number of measurement issues that limit our

understanding of these relationships. Thus in the present study, we will extend prior research on the relationship between the perceived descriptive norm, perceived injunctive norm and alcohol use in college students by utilizing similar scales of measurement for the norms measures and by using a measure of heavy alcohol use. It is hypothesized that the perceived descriptive norm will be a better predictor of concurrent heavy alcohol use than will the perceived injunctive norm. However, it is hypothesized that perceived injunctive norm will be a better predictor of future heavy alcohol use than will the perceived descriptive norm. It is also hypothesized that the perceived injunctive norm will explain additional variance in heavy alcohol use beyond the perceived descriptive norm. However, this combined effect is hypothesized to be additive, not multiplicative. Possible confusion about the interaction between the perceived injunctive norm and perceived descriptive norm in predicting heavy alcohol use is discussed in the next section.

Combined Effect of the Perceived Descriptive and Injunctive Norm on Alcohol Use

The perceived injunctive norm and perceived descriptive norm have been found to explain unique variance in college alcohol use (Rimal & Real, 2005). As described earlier, however, the FTNC suggests that the situation most conducive to behavior is when both norms are aligned. This proposition has led a number of researchers to examine the interaction between perceived descriptive and injunctive norms in predicting alcohol use.

Rimal and Real (2003) predicted that the positive relationship between the perceived descriptive norm and alcohol use intentions would be stronger for students who perceive society to highly approve of alcohol use. Although the interaction term was significant, the effect was in the opposite direction of the hypothesis. The relationship between the perceived descriptive norm and alcohol use intentions was stronger among the low injunctive norm group than high injunctive norm group. Alcohol use was a composite score of nine drinking items. Participants

were asked, "*Indicate the typical number of drinks consumed at home, social party, or restaurant/bar.*" This one question prompted three separate responses (home, social party, or restaurant/bar). They were also asked to indicate the number of drinks for beer, wine and liquor for the three locations. As a result, there were a total of nine items.

Rimal and Real (2005) conducted the same study as Rimal and Real (2003) except the measure for the perceived injunctive norm was in reference to close friends and not societal approval. Secondly, the alcohol use measure consisted of three items measuring intentions and not self-reported past behavior. Not surprisingly, the interaction term between the perceived descriptive norm and perceived injunctive norm did not explain any significant variance in the prediction of alcohol use intentions. Alcohol use intentions were measured with three different items on frequency of intended number of drinking days within one week.

In a third study, Rimal (2008) examined this relationship again, this time measuring the injunctive norm with the question, "Is it appropriate for students to drink every weekend?" The alcohol use measure was the same as that of Rimal and Real (2005). In this case, the interaction term between the perceived descriptive norm and perceived injunctive norm was significant and in the hypothesized direction in predicting alcohol use intentions. It is unclear whether this different result is due to the different question used for the injunctive norm, whether it occurred by chance (one study out of three), or whether it is a genuine effect.

Regardless of the source of the finding, however, we would argue that the prediction made across these three studies is not consistent with the FTNC. We assert that the combined effect of the perceived injunctive norm and perceived descriptive norm is additive, not multiplicative. Behavior should be highest among those who perceive the descriptive norm and

injunctive norm to both be high. Similarly, behavior should be lowest among those who perceive the descriptive norm and injunctive norm to be both low.

Gockeritz et al. (2010) did find an interaction between the perceived injunctive and perceived descriptive norms in the prediction of household energy conservation behavior. Consistent with the theoretical hypothesis of Rimal and Real (2003), the correlation between the perceived descriptive norm and behavior was stronger for those who had a high perceived injunctive norm. However, the measure of the perceived injunctive norm was unipolar and not bipolar. Thus, when people had a low score on a unipolar scale for the perceived injunctive norm they "lacked approval", that is, they were "neutral." In this case the interaction is actually consistent with the FTNC because a high norm would be more influential than a neutral norm. However, when using a bipolar scale, as used by Rimal and Real, a low score of "disapproval" should not be less influential than "approval."

Additional Theoretical Considerations

Subjective norm. A subjective norm is obtained by asking participants to rate the extent to which "*important others*" would approve or disapprove of them performing a specific behavior (Ajzen, 1991). Rimal and Real (2005) suggest that an injunctive norm within the FTNC is the same as a subjective norm within the Theory of Planned Behavior (TPB) because they both refer to the perceived approval of others. However, there is one important distinction between the two constructs. A subjective norm specifies the reference group to include only "important others." An injunctive norm does not specify a distinct reference group. However, this important distinction is not always followed and the terminology within normative research is not always consistent (Maddock & Glanz, 2005).

Park, Klein, and Smith (2009) conducted a hierarchical regression in which behavioral intentions to drink alcohol was the outcome. Attitudes, subjective norms and perceived behavioral control were entered into the first block; and injunctive and descriptive norms were entered into the second block. Both blocks were significant. The first block predicted 51% of the variance associated with behavioral intentions and the second block added an additional 2% of variance. While there is much overlap between the TPB and FTNC the additional variance predicted by the perceived descriptive norm and the perceived injunctive norm over and above attitudes, subjective norms and perceived behaviors control (theory of planned behavior) demonstrates that they are distinctly different.

Perceived parental approval. Perceived parental approval has been consistently found to be positively correlated with college student alcohol use and alcohol-related negative consequences (Boyle & Boekeloo, 2009; LaBrie, Hummer, Lac, Ehret, & Kenny, 2011; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Wood, Read, Mitchell, & Brand, 2004). Perceived parental approval is also sometimes used within a composite score for a subjective norm, because a subjective norm is perceived approval from important others. Perceived parental approval for college alcohol use has been found to have a weaker association with self-reported alcohol use than perceived peer approval. However, perceived parental approval is still significantly associated with self-reported alcohol use. If the parents stop sharing their disapproval of college alcohol use with their children, the child may misperceive how accepting their parents are of college alcohol use. This misperception is very likely considering that most college students already misperceive the approval of alcohol use among their college peers.

LaBrie and Cail (2011) reported that mother-daughter contact was associated with lower drinking and mother-daughter contact moderated the relationship between the perceived peer

descriptive norm and alcohol use. The relationship between the perceived peer descriptive norm and alcohol use was weaker for students who scored high on mother-daughter contact. This shows that peers are less influential when the parent plays a larger role in the student's life (more contact). Lastly, parents may not approve of college alcohol use for a few different reasons. One, they disapprove of alcohol use (low injunctive norm) because they do not think it is appropriate due to academic and health risks. A second reason for disapproving of alcohol use is that they are morally against alcohol use, which represents a low personal norm.

Personal Norms/Values

A personal norm is defined as a personal feeling of moral obligation on how one ought to behave and is distinctly different from an attitude (Schwartz & Tessler, 1972). The wording of "norm" within the title of personal norms should not be taken literally because it does not represent a majority. A personal norm is more representative of a moral attitude or personal value. The terminology within personal norms has been slightly inconsistent with personal norms also being referred to as personal approval (Lee et al., 2007), personal drinking values (Corbin et al., 2011), personal attitudes (Cameron & Campo, 2006; LaBrie et al., 2010) and personal alcohol attitudes (Perkins & Wechsler, 1996). Similar to the perceived descriptive norm and the perceived injunctive norm, personal norms can predict behavior when focal (Kallgren et al., 2000). Rinker and Neighbors (2013) reported that personal disapproval/lack of interest significantly predicted abstinence of alcohol use, but not the perceived injunctive norm. This suggests that abstaining from alcohol is less based on perceived norms and more based on personal values.

Kallgren et al. (2000) had participants complete a survey in the lab regarding their personal norm toward littering. Half the participants watched themselves on a closed circuit

television and the other half of participants watched a closed circuit television with pictures of abstract figures (control). As the participants left the lab they were given the opportunity to litter or not litter. Results showed that for participants in the control condition, the personal norm of littering (survey) was not correlated with actual littering behavior as participants left the lab. However, for the group that watched themselves on closed circuit television their personal norm of littering (survey) was positively correlated with their littering behavior. Kallgren et al. (2000) suggested that the act of looking at oneself on a television activated their personal norm. In conclusion, we have many personal norms, but only behave consistent with our personal norms when they are activated or salient

CHAPTER II

OVERESTIMATING AND CORRECTING PERCEIVED NORMS

Overestimation of Norms

Borsari and Carey (2003) conducted a meta-analysis of 23 studies that investigated the relationship of perceived norms with college alcohol use. One of the most consistent findings across the 23 studies was that students overestimate the quantity and frequency of alcohol consumed by their peers (perceived descriptive norm) at the group level. More specifically, not one study reported an underestimation of peer alcohol use. While this finding is robust, there is currently no consensus as to why this overestimation occurs. An overestimation is calculated by first computing the mean for self-reported alcohol use. This overall mean is then compared to participants' perceptions of peer alcohol use (perceived peer descriptive norm). If the overall mean of self-reported alcohol use is lower than perceived peer alcohol use, participants are overestimating perceived peer alcohol use. It is also possible that students are underestimating their own drinking with self-report. However, the majority of previous studies consider this to be an overestimation of peer use (Borsari & Carey, 2003). This overestimation can be measured at the group level or individual level.

One major concern regarding the overestimation of peer alcohol use is that perceptions of peer alcohol use and self-reported alcohol use are positively correlated (Borsari & Carey, 2003). Researchers are concerned that if students are overestimating the consumption of alcohol use by their peers, they are going to increase their own personal drinking to keep up with what they perceive as normative (Borsari & Carey, 2003). After a failed alcohol prevention campaign that focused on the health consequences of alcohol use, Northern Illinois University implemented the

very first campus-wide social norms marketing campaign in 1989. In an attempt to reduce students' overestimations of peer alcohol use, a social norms marketing campaign simply advertised the actual drinking norms of students. The theory contends that if the advertisements can reduce students' overestimations of peer alcohol use, students should reduce their own personal alcohol use based on their new lowered perception of peer alcohol use (Haines & Barker, 2003).

NIU placed social norms messages on posters, flyers, advertisements, and articles in the school newspaper. The program focused on promoting moderate drinking, not ridiculing heavy drinking, and displaying positive and upbeat photographs of attractive, healthy looking college students having fun in a variety of settings. Results showed that from 1989 to 1998, the percentage of students who reported heavy drinking was reduced from 45% to 25% (45% relative reduction), the percentage of students who reported alcohol-related injuries decreased from 36% to 16% (55% relative reduction), and the percentage of students identifying themselves as an alcohol abstainer rose from 9% to 19% (110% relative increase; Haines & Barker, 2003). While the campaign is a possible reason for the reduction in alcohol use, causal statements cannot be made because it was not an experimental design with a control group.

It is very important to take note of the increase in abstainers at NIU with the introduction of a social norms message, even though a social norms message does not preach abstinence from alcohol. Even though the social norms campaign states that some other students do in fact drink, the take home message is that most students drink responsibly or do not drink at all. As a result, if you choose to abstain from alcohol you still fit in with the college culture. More interestingly, the previous campaign at NIU that did preach abstinence from alcohol and advertised the health-related consequences of alcohol use did not achieve an increase in abstainers. This suggests an

indirect approach of message framing for behavior change. If a university wants to increase abstinence of alcohol use, the message should be focused on social norms, not abstinence. Lastly, from a multi-year campaign strategy, if a campaign is successful and alcohol use levels decrease, one will be able to advertise a lower drinking norm in the next year. This cycle can also be repeated infinitely. As a result, large reductions in overestimations and alcohol use may be possible over multiple campaign years.

After NIU reported their success, many other schools implemented similar programs, hoping for similar results (Gomberg, Schneider, & DeJong, 2001). The University of Mississippi, Rowan University, University of Arizona, and Hobart and Smith College were able to significantly reduce overestimations and alcohol use (Glider, Midyett, Mills-Novoa, Johannessen, & Collins, 2001; Gomberg, et al., 2001; Jeffrey, Negro, Millar & Frisone, 2003; LaBrie, Hummer, Neighbors, & Pedersen, 2008; Mattern & Neighbors, 2004; Perkins & Craig, 2003; Schroeder & Prentice, 1998; Stamper, Smith, Gant, & Bogle, 2004; Steffian, 1999; Turner, Perkins, & Bauerle, 2008). However, some programs were able to reduce only overestimations (Barnett, Far, Mauss, & Miller, 1996; Lederman, Stewart, & Russ, 2007; Lewis, Neighbors, Lee, & Oster-Aaland, 2008; Smith, 2004) and other programs were not able to reduce overestimations or alcohol use (DeJong et al., 2009; Prentice, & Miller, 1993; Reilly & Wood, 2008; Werch, Pappas, et al. 2000). Given the large success of the NIU intervention, mixed results from subsequent interventions at other schools are concerning and using norms to predict and change college alcohol use has been debated (Clapp & Lange, 2005; Perkins, 2005).

To summarize, one of the most consistent findings within college alcohol use is that college students overestimate the quantity and frequency of peer alcohol use. This is a consistent finding across data from 48,168 students across 100 institutions (Perkins, Meilman, Leichliter,

Cashin, & Presley, 1999), a separate data set of 76,145 college students from the United States across 130 institutions (Perkins, Haines, & Rice, 2005), a meta-analysis consisting of 23 separate research articles (Borsari & Carey, 2003), and outside of the United States in such places as Canada (Perkins, 2007), Scotland (McAlaney & McMahon, 2007) and France (Franca, Dautzenberg, & Reynaud, 2010). One of the largest overestimations of peer alcohol use comes from Chiauzzi, DasMahapatra, and Black (2013) who provided data from 21,945 first-year students across 89 different institutions. Results showed that the perceived descriptive norm for number of drinks per week for students who drink was 23.1, but self-reported drinks per week was 5.7, demonstrating a 405% overestimation of peer alcohol use. While there is extensive evidence that college students overestimate injunctive and descriptive norms there is currently no consensus for the origin of the overestimation. However, a number of psychological phenomena have been implicated including the fundamental attribution error, confirmation bias, false consensus and false uniqueness.

Glazer, Smith, Atkin, and Hamel (2010) suggest that the overestimation of the perceived peer descriptive norm for college alcohol use could be explained by the fundamental attribution error. When students observe *another student* walking home drunk from a party, they are more likely to attribute the drinking to a disposition (he is a drinker and will drink regardless of the situation) whereas when they themselves drink they attribute it to situational factors (e.g., it was a friend's birthday party). Individuals who drink 'because they are drinkers' will drink more frequently than individuals who drink only on special occasions, thus accounting for the overestimation. Alternatively, Lederman, Lederman, and Kully (2004) contend that the overestimation of peer alcohol use persists on campus due to confirmation bias. Students come to campus with a high perceived descriptive norm for peer alcohol use. Once on campus, students

are more motivated to identify other students who are drunk than other students who are sober to confirm their perceptions. Similarly, Deviance Regulation Theory suggests that counter-normative behavior of being drunk stands out and normative behavior of being sober blends into the perceptual background (Blanton & Christie, 2003). Someone stumbling home drunk is more noticeable and more likely to be remembered than someone walking home sober. As a result, when students are asked to estimate the amount of alcohol consumption among their peers they are more likely to remember the small number of students stumbling home drunk than the larger number of students walking home sober.

Taylor (2012) suggests that in an effort to maintain a high self-image, people view their unhealthy behaviors as widely shared but their healthy behaviors as more distinctive. This is consistent with application of false consensus and false uniqueness in Lewis et al. (2010). Heavy drinkers may overestimate peer drinking due to false consensus. In order to justify this unhealthy behavior and maintain a high self-image, the heavy drinker believes that many others drink. Utpala-Kumar and Deane (2012) reported that frequent heavy episodic drinkers estimated that their peers consumed similar amounts of alcohol. Secondly, abstainers may overestimate peer drinking and underestimate the number of abstainers due to false uniqueness. This is consistent with data from Park, Smith, Klein, & Martell (2011) in which students who consumed four drinks or less underestimated other students who drank four drinks or less. In addition, students who consumed five drinks or more overestimated the number of other students who drank five drinks or more.

Overestimations of college alcohol use may also come from resident assistants' attitudes and expectations. In a study by King, Borsari, and Chen (2010) resident assistants overestimated the frequency of alcohol use among students. Similarly, Rubington (1990) conducted a series of

focus groups with resident assistants regarding alcohol policies. One of the emerging themes from the focus groups was that resident assistants focused on offering advice to the resident hall students on how to avoid receiving an alcohol-related ticket. If communication is focused on how not to get caught with alcohol, then perhaps resident assistants are contributing to the misperception that drinking is common (perceived descriptive norm) and drinking is approved of by their superiors (perceived injunctive norm).

Another possible origin of overestimations of college alcohol use is movies displaying a fictitious college lifestyle with non-stop partying and very little or no class attendance (*Animal House, Old School, Road Trip, & Van Wilder*). Movie exposure with alcohol themes was found to be positively associated with alcohol use in a sample of 10- to 14 year-olds (Cin et al., 2009). Similarly, first-year college student exposure to college drinking movies in fall semester was positively correlated with alcohol use one month later r=.30 (Osberg, Billingsley, Eggert, & Insana, 2012). This relationship was also significantly mediated by the perceived injunctive norm and perceived descriptive norm at time two, suggesting that a change in alcohol use is associated with a change in perceived norms. These movies could possibly explain other alcohol related misperceptions often depicted in the movies such as pre-partying and drinking games (Pedersen & LaBrie, 2008), alcohol use at 21st birthdays and tailgating (Neighbors, Oster-Aaland, Bergstrom, & Lewis, 2006), protective behavioral strategies (Benton, Downey, Glider & Benton, 2008; DeMartini, Carey, Lao, & Luciano, 2011; Lewis, Rees, & Lee, 2009) and peer approval of alcohol-related negative consequences (Lee, Geisner, Patrick, & Neighbors 2010). Nguyen, Walters, Rinker, Wyatt, and DeJong (2011) reported that 7.7% of first-year students have a fake ID before their first semester, evidence that students are expecting to be in drinking situations,

and the actual percentage could be much higher because students might be afraid to report owning a fake ID even on an anonymous survey.

DeJong (2010) argues that when students see shot glasses with the school logo on them for sale at the bookstore, the school is sending a message that drinking occurs here (descriptive norm) and that university officials approve of drinking (injunctive norm). Consistent with this idea, Martens, Page, et al. (2006) reported that students significantly overestimated perceived norms for alcohol use because of the cultural stereotype of college life. The measure, College Life Alcohol Salience Scale (CLASS), was recently developed by Osberg et al. (2010) and evaluates the cultural stereotype of college alcohol use with questions such as, "*To become drunk is a college rite of passage*" and "*Alcohol is not an important part of college life*." Not surprisingly, Osberg, Insana, Eggert, and Billingsley (2011) found the CLASS scale to positively predict college alcohol use.

While many students may come to campus with expectations of high levels of alcohol use, it is our contention that after spending one semester on campus students begin to understand that the type of lifestyle depicted in the movies is not real and their overestimations will decrease without intervention. Some institutions have tried to speed this process up by requiring first-year college students to complete an alcohol norms correction program such as alcohol.edu or mystudentbody.com. Although these programs have not been evaluated nearly as much as social norms campaigns, they have shown some success (Chiauzzi, Green, Lord, Thum, & Goldstein, 2005; Paschall, Antin, Ringwalt, & Saltz, 2011; Wall, 2008).

Normative Feedback Interventions

Normative feedback is typically presented to college students in one of two different ways. The first strategy is to present only the campus drinking norm to students. The second

strategy is to present the campus drinking norm to students in combination with their own drinking data. This allows participants to directly compare their alcohol use behavior with the campus norm. The first strategy is typically implemented through a campus wide field intervention and is labeled social norms marketing. The second strategy is typically performed within a laboratory setting and referred to as personalized normative feedback.

Social norms marketing campaigns. Due to the promising data from the social norms marketing campaign at NIU (Haines, 1996; Haines & Barker, 2003), many schools have decided to implement similar interventions. As stated above, some successful interventions have been able to reduce self-reported alcohol use or alcohol-related negative consequences. Other partially successful interventions were able to reduce misperceptions of college alcohol use, and some unsuccessful interventions were not able to reduce misperceptions or alcohol use.

One reason for the failure of some campaigns is that an intervention is designed by a practitioner who is not familiar with the theory (Glassman & Braun, 2010; Johnson, 2012). The California State University system mandated that every campus have a social norms campaign, without consideration of having someone on campus to implement it correctly. In one example, San Diego State University had their social norms marketing campaign designed by a professional marketing company unfamiliar with the theory (Russell, Clapp, & DeJong, 2005). The marketing company pilot tested the messages to make sure that students had positive attitudes toward the campaign messages. However, the marketing company should have asked the students questions regarding the norms being illustrated on the posters. If the students do not correctly interpret the norms being displayed on the posters, having a positive attitude toward the messages will not be associated with reductions in self-reported alcohol use. Considering the

lack of theoretical understanding of the campaign, it was not surprising that alcohol use among students did not decrease with the introduction of the campaign.

Another possible reason why some campaigns have not been successful is because the time span given for the campaign is not long enough to adequately change alcohol use. Some interventions that were able to reduce misperceptions, but not alcohol use were conducted over the span of one semester or less (Lewis et al., 2008; Smith, 2004), while other successful campaigns were implemented over six years (Turner et al., 2008) and 10 years (Haines & Barker, 2003). Johnson (2012) gave a brief social norms presentation on a tablet to students as they crossed the border into Mexico. Results showed that reductions in perceived norms were significantly associated with lower levels of BAC upon returning back to the United States. Although the effect was very small, the dose was equally as small. Social norms marketing campaigns attempt to change the culture of drinking at an institution which takes years not months (NIAAA, 2002). It is argued that large and significant reductions in college alcohol use are possible, but only with large doses of social norms theory over long periods of time.

One last reason why some social norms marketing campaigns may appear to be unsuccessful (but may not actually be a failure) is because of a lack of a control group. DeJong et al. (2006) is one of the rare studies that included a control group. Researchers evaluated the effectiveness of a social norms marketing campaign across 18 colleges/universities (nine treatment and nine control). Results showed that decreases among the drinking variables in the treatment group ranged from 1.1% to 10.6%. However, increases in the drinking variables in the control group ranged from 17.5% to 24.7%. The control group accounted for a historical national trend from 2000-2003 in which drinks consumed per week rose from 5.8 drinks in 2000 to 6.5 drinks in 2003 (12% increase) on average for all college students at the group level.

To recap, inconsistency in the results of social norms campaigns for reducing alcohol use on college campuses has sparked debate within the field (Clapp & Lange, 2005; Perkins, 2005). Although it is possible that this approach is not effective, it seems more likely that many of the social norms marketing campaigns failed because the campaigns themselves were implemented poorly. Three suggestions are given to guide successful campaigns. One, the organization creating the campaign should be familiar and understand social norms theory (Glassman & Braun, 2010; Johnson, 2012; Russell et al., 2005). Two, campaigns are more likely to be successful if they are at least two semesters long and preferably longer (Haines & Barker, 2003; Lewis et al., 2008; Smith, 2004; Turner et al., 2008). Three, the effectiveness of the intervention can be more properly measured with the addition of a control group for comparison to the treatment group (DeJong et al., 2006). While these three suggestions do not guarantee success, they will significantly improve the chances of a successful campaign.

Personalized normative feedback. In contrast to social norms marketing campaigns, personalized normative feedback interventions give participants direct comparisons of their own personal alcohol use levels with peer alcohol use norms. Successful interventions have reduced future intentions of alcohol use (Neal & Carey, 2004) and self-reported alcohol use (Collins, Carey, & Sliwinski, 2002; Bewick, Trusler, Mulhern, Barkham, & Hill, 2008), while others have reduced misperceptions only (Henslee & Correia, 2009; Geisner, Neighbors, Lee, & Larimer, 2007; Peeler, Far, Miller, & Brigham, 2000). The biggest limitation to this approach is that it is most effective for heavy drinkers and least effective for light drinkers (Agostinelli, Brown, & Miller, 1995; Neighbors, Larimer, & Lewis, 2004). If researchers screen participants and identify the heavy drinkers, the researchers are going to be confident that the campus norm given to the participants will be lower than the participant's self-reported drinking. If you do not screen for

heavy drinkers, there is concern that the campus norm given to the participant might be higher than their self-reported drinking. This type of effect occurred in Palfai, Zisserson, and Saitz (2011) in which participants who received personalized normative feedback scored lower on weekly drinking and heavy episodic drinking than a control group who did not receive anything. However, this effect only occurred for participants who scored high on alcohol consequences. For participants who scored low on alcohol consequences, those in the personalized normative feedback group were not significantly different on weekly drinking and heavy episodic drinking than the control group.

Neighbors et al. (2011) compared the effectiveness of personalized normative feedback against a social norms message and a control message in a sample of light drinkers and abstainers. Participants in the personalized normative feedback group received information regarding the campus alcohol use norm and how that compared to their personal alcohol use. Participants in the social norms group only received the campus alcohol use norm. Results showed that participants in the personalized normative feedback group and social norms marketing group (no personal feedback) reported a significantly lower perceived norm and number of drinks per week than did participants in the control group six months post-intervention. This demonstrated that both interventions were significantly better than the control group. However, when comparing the two interventions, participants in the social norms marketing group (no personal feedback) reported a significantly lower perceived norm and drinks per week than the personalized normative feedback group six months post-intervention. These results show that among a sample of light drinkers and abstainers a social norms message might be more effective than personalized normative feedback.

Behavioral Motivation Intervention includes a component of personalized normative feedback along with information on alcohol-related problems, situations associated with heavy drinking, and alcohol expectancies. BMI has been shown to be effective in reducing alcohol use among heavy drinkers (Wood, Capone, Laforge, Erickson, & Brand, 2007), alcohol use among regular drinkers (Carey et al., 2009) and alcohol-related negative consequences (Borsari & Carey, 2005). In conclusion, personalized normative feedback shows promise as an effective strategy for reducing college alcohol use with social norms. However, the main limitation to this approach is that it is often more effective among heavy drinkers than light drinkers.

Reference Groups of Perceived Norms

College students' perceptions of the descriptive norm and injunctive norm have been found to be positively correlated with their own self-reported alcohol use. However, the strength of the association varies depending on the type of reference group. In a sample of college athletes, Martens, O'Connor, Duffy-Paiement, and Gibson (2006) reported that in a regression predicting alcohol use and alcohol problems, perceived athlete norms predicted more variance than non-athlete norms. Pedersen, LaBrie, and Hummer (2009) collected data from participants before and during their study abroad trip. Results showed that alcohol use increased while abroad for students who perceived a high descriptive norm for alcohol use among their study abroad cohort but not for students who perceived a low descriptive norm for alcohol use. This effect was replicated in Pederson, Larimer, and Lee (2010) with data collected before and after the study abroad experience. These results suggest that when students are in a different country studying abroad, their current study abroad cohort becomes their reference group and not the people within the country they are currently visiting.

Consistent with the immediacy principle, the relationship between norms and behavior is stronger for more proximal groups such as living in the same residence hall than more distal groups such as living in a different residence hall (Borsari & Carey, 2003; Bourgeois & Bowen, 2001; McAlaney & McMahon, 2007; Neighbors, LaBrie, et al., 2010), peers in closer social distance (Yanovitzky, Stewart, & Lederman, 2006) and peers in a specific chapter of a fraternity compared to a national fraternity (Trockel, Wall, Williams, & Reis, 2008). Lewis and Clemens (2008) reported that the perceived alcohol use norm of same-sex friends, in comparison to opposite-sex friends, was more strongly associated with self-reported alcohol use. Similarly, Lewis (2007) found that the perceived alcohol use norm of same-sex closest friends' was the best predictor of self-reported alcohol use. Additionally, Neighbors et al. (2008) demonstrated that the relationship between the perceived injunctive norm and self-reported alcohol use was stronger for a gender specific reference group r=.15, than a gender neutral reference group, r=.04. Lastly, in experimental studies, participants who received gender specific feedback reduced their alcohol use more than participants who received gender neutral feedback (Lewis & Neighbors, 2007; Lewis, Neighbors, Oster-Aaland, Kirkeby, & Larimer, 2007; Neighbors, Lewis, et al., 2010).

Another example illustrating a stronger relationship between perceived norms and alcohol use for more proximal groups than distal groups is the well-documented difference in the predictive power of typical student norms versus friend norms. Previous research has shown that self-reported alcohol use is more strongly associated with friend norms than with norms regarding the typical student at the university (Cho, 2006b; Collins & Spelman, 2013; Halim, Hasking, & Allen, 2012) or most students at the university (Polonec et al., 2006). Lewis (2005) reported the same effect for alcohol-related negative consequences. Cullum, O'Grady, Sandoval,

Armeli, and Tennen (2013) reported that the relationship between perceived alcohol use among friends and self-reported alcohol use was higher when participants reported low social support from friends. In an effort to gain acceptance into the group, group norms are salient to the participant and mimicked. Similarly, Litt, Stock, and Lewis (2012) reported that the relationship between the perceived norm of best friend alcohol use and willingness to drink alcohol was stronger among participants scoring high on need to belong in comparison to participants who scored low on need to belong. It is important to note that the samples of these studies consisted of mostly White students.

LaBrie, Atkins, Neighbors, Mirza and Larimer (2012) found self-reported alcohol use to be more associated with the perceived norm of a more proximal than distal group. However, this effect was only significant for White students and not Hispanic students. Hispanic students perceived norms of alcohol use for "students in general" were more associated with self-reported alcohol use than were same-ethnicity perceived norms. Similarly, Martin, Groth, Buckner, Gale and Kramer (2013) reported that among a sample of Black students, the perceived norm of the typical student was significantly associated with self-reported alcohol use, but the perceived norm for same-ethnicity was not. Future research should investigate why more distal groups have been found to be more strongly associated with self-reported alcohol use than more proximal groups for minority groups. One possible suggestion is that minority students may score higher on collectivistic orientation than White students.

Prince and Carey (2010) reported that participants who received the injunctive norm feedback for a typical student reported significantly lower injunctive and descriptive norms (for the typical student) than the control group, post-feedback. Surprisingly, this effect was not found for perceptions of the injunctive norm of friends and the descriptive norm of friends. This may

seem counterintuitive because the perceived norms of friends are supposed to be more influential than perceived norms of the typical student (Thombs, Ray-Tomasek, Osborn, & Olds, 2005). However, perhaps within an experimental design perceived norms of friends are more difficult to manipulate and therefore less likely to result in behavior change.

LaBrie et al. (2013) reported a similar result in that a personalized normative feedback intervention illustrating the descriptive norm of the typical student was more effective in reducing self-reported alcohol use than tailored messages using gender, race and/or Greek affiliation. Again, this seems counterintuitive and was not expected. The authors suggest that one possible reason for the effectiveness of the typical student message is that recipients are free to create different ideals of who the typical student is at their institution. Lewis and Neighbors (2006) addressed this idea by asking participants to list the demographics of who they think is the typical student at their institution. Approximately 68% of participants indicated that the typical student was male, with 57% male being reality. Additionally, 100% of participants thought the typical student was non-Hispanic White, with 89% being reality. A total of 54% stated that the typical student lived off campus, with 68% being reality. Lastly, 89% of participants estimated the typical student to be non-Greek, with reality being 99%. In conclusion, these results demonstrate that most participants are accurate in predicting the demographics of the typical student (majority).

Reflective norms are perceptions of how much an individual believes the opposite sex prefers them to drink. LaBrie, Cail, Hummer, Lac, and Neighbors (2009) reported that women overestimated reflective norms for alcohol use for the typical college woman, friend, date and romantic partner. Similarly, Hummer, LaBrie, Lac, Sessoms, and Cail (2012) reported that women overestimated reflective norms for alcohol use for friend, date and sexual partner. While

men overestimated reflective norms for alcohol use for date and sexual partner, they underestimated reflective norms for friend. This may be partly due to high levels of reflective norms for friend for both genders. The descriptive data showed reflective norms for drinks per week for a friend (*F*=5.91; *M*=4.52) are much higher than a dating partner (*F*=1.92; *M*=1.69) and sexual partner (*F*=2.11; *M*=1.84). Perhaps this is evidence for both genders having a desire for an opposite-sex drinking buddy. Glassman and Braun (2010) suggested that social norms messages based on dating preferences may be effective, "most students prefer to date someone who doesn't drink too much" (pg. 100). Future social norms campaigns may want to consider trying to target misperceptions of preferred dating characteristics regarding alcohol use.

Lastly, a very influential reference group in a college setting is academic status (first-year, sophomore, junior or senior). Brannon and Pilling (2005) reduced alcohol intentions among underage drinkers with a written Public Service Announcement emphasizing maturity, "don't drink like a freshman." Brannon and Pilling (2005) suggest that this was effective for two reasons. One, the reference group of upperclassmen has a higher social status than the reference group of underclassmen on a college campus. Two, upperclassmen tend to drink more moderately (less heavy episodic drinking). As a result, underclassmen can increase their social status by mimicking the behavior of upperclassmen, which includes drinking more moderately. This also suggests that self-reported alcohol use is not stable in college but changes over time.

Alcohol Use and Perceived Norms Changing Over Time (Non-Experimental)

Self-reported alcohol use and perceived norms of alcohol use have been shown to increase from senior year of high school to the first semester of college (Bingham, Shope, & Tang, 2005; Harford, Wechsler, & Muthen, 2003; Wetherill & Fromme, 2007). However, what happens to alcohol use after students arrive on campus? Very little research compares alcohol

use from first semester to second semester of college. Consistent with social learning theory, it has been suggested that alcohol use and perceived norms of alcohol use should continue to increase if one continues to interact with drinkers (Merrill, Read, & Colder, 2013). However, many studies have provided descriptive data showing a decrease in alcohol use and perceived norms from the first year of college to future years without any significance testing (Baer, 1994; Lee et al., 2010; Neighbors, Dillard, Lewis, Bergstrom & Neil, 2006; Robertson & Forbes, 2011).

For example, Neighbors et al. (2006) reported no significant reduction in the overestimation of college alcohol use over a two month period among a sample of 79% underclassmen. However, an examination of the data reveals that this might be due to the perceived descriptive norm and self-reported alcohol use both dropping from time one to time two, keeping the overestimation constant. A concept that is similar to an overestimation is a Self-Other Discrepancy (SOD). An SOD is calculated by measuring the difference between self-reported alcohol use and perceived descriptive norm at the individual level. In a sample of heavy drinkers Carey, Borsari, Carey and Maisto (2006) reported that the larger the SOD at baseline the more likely participants were to increase their drinking from baseline to the one month follow-up survey.

It is suggested that students' initial perceptions of the college lifestyle may be based on unrealistic depictions through the media. After students start classes, they begin to get a more realistic understanding of college life and lower their perceptions of peer alcohol use to more accurate levels. O'Grady, Cullum, Tennen, and Armeli (2011) reported a significant decrease in the perceived norm of typical number of drinks consumed at social events from year one to year four among college women. Interestingly, this score increased from year one to year four for

college men. A similar gender effect occurred in Fairlie, Wood, and Laird (2012) in which there was a significant increase in heavy episodic drinking from first year to second year for men but not women. Perhaps this gender difference is more properly explained in differences between heavy drinkers and light drinkers? Based on previous research, men are more likely to be heavy drinkers and women more likely to be light drinkers. Heavy drinkers (mostly men) might be more likely to seek out drinking situations and therefore increase their drinking over time. Light drinkers (mostly women) might realize that their peers are not drinking as much as they originally estimated and therefore their drinking levels decrease over time.

Broadwater, Curtin, Martz and Zrull (2006) reported that overall drinking, desire to drink and perceived descriptive norm of alcohol use significantly decreased among a sample of mostly first-year students (80.1%) across a time span of one month. However, one important limitation to the study was that abstainers were deleted from the dataset for time one. This is problematic because a drinker at time one had the option of being a non-drinker at time two, but a non-drinker at time one did not have the option of being a drinker at time two. This limitation could have directly influenced the decrease in alcohol use and indirectly influenced the decrease in the perceived norm and drinking desire.

Ferrer, Dillard, and Klein (2012) reported a significant reduction in perceived norms and alcohol use over time, but placed their results within a different theoretical framework. Ferrer et al. (2012) suggested that while first-year students are concerned with social norms and fitting in, sophomores are more concerned with establishing a self-identity. Consistent with deviance-regulation theory (Blanton & Christie, 2003), one engages in counter-normative behavior (reduced alcohol use) in an effort to establish a self-identity. While this theory is consistent with reductions in alcohol use, it is not consistent with reductions in perceived norms. If sophomores

are motivated to establish a self-identity by drinking less, their perception of alcohol use among their peers should stay the same or increase. A bigger difference between perceived norms of peers and self-reported behavior gives a better chance for establishing a self-identity.

In conclusion, patterns of college alcohol use and perceived norms of college alcohol use over time have been mixed. Classic social learning theory would suggest an increase in drinking over time after being on campus longer and seeing more people drink. However, first-year students are more likely to engage in heavy episodic drinking than other students. It is suggested that incoming first-year students arrive on campus with unrealistically high perceptions of peer alcohol use and thus drink more heavily based on that perception. This unrealistic perception is slowly corrected after spending additional time on campus and realizing that peers are not drinking as much as they originally perceived.

Mediation of Norms

As described earlier, the goal of social norms marketing campaigns is to change perceived norms of college alcohol use to more accurate levels, based on the premise that, if a social norms marketing campaign is able to reduce a student's misperception of college alcohol use to a more accurate level, personal alcohol use should also decrease. In both etiological studies and intervention studies, norms have been demonstrated to be significant mediators in the relationship between an intervention and self-reported alcohol use.

The perceived descriptive norm has been shown to mediate or partially mediate the relationship between broad social motives and alcohol use (Corbin et al., 2011), normative feedback and alcohol use (DeJong, et al., 2006; Neighbors et al., 2004; Neighbors, Lee, Lewis, Fossos, & Walter, 2009; Neighbors et al., 2010; Wood, et al., 2010), drinking intentions and alcohol use (Testa, Kearns-Bodkin, & Livingston, 2009), and athlete status and alcohol use

(Turrisi, Mastroleo, Mallett, Larimer, & Kilmer, 2007). In a longitudinal design, Abar and Maggs (2010) reported that the relationship between the perceived descriptive norm of friends at time one with alcohol use at time two was partially mediated by the perceived descriptive norm of friends at time two. These results suggest that the relationships between these various variables with self-reported alcohol use are dependent upon the perceived descriptive norm.

Moreover, the perceived injunctive norm has been shown to mediate or partially mediate the relationship between drinking intentions and alcohol use (Testa, et al., 2009), athlete status and alcohol use (Turrisi et al., 2007), and the importance of religion and alcohol use (Chawla, Neighbors, Lewis, Lee, & Larimer, 2007). These results suggest that the relationships between these variables and self-reported alcohol use are dependent upon the perceived injunctive norm.

A few studies have also measured the mediation effect of perceived norms within the relationship between the social norms campaign and self-reported alcohol use. LaBrie et al. (2008) and Martens, Smith and Murphy (2013) both reported that the perceived descriptive norm mediated the social norms intervention effect. More specifically, changes in the perceived descriptive norm at time two mediated the intervention effect on self-reported alcohol use at time three. This demonstrates that the intervention at time one was able to significantly change self-reported alcohol use at time three by changing the perceived descriptive norm at time two. Similarly, in a personalized normative feedback intervention, Lewis et al. (2007) reported that a reduction in self-reported alcohol use at five months post-intervention was mediated through the reduction of the perceived descriptive norm at three months post-intervention.

In conclusion, social norms marketing campaigns are based on the theory that if perceived norms are reduced, a reduction in self-reported alcohol use should follow. However, this premise has been investigated in surprisingly few etiological and intervention studies. The

limited amount of research does suggest that perceived norms do mediate the relationship between the described variables and self-reported alcohol use.

CHAPTER III

NON-NORMATIVE FACTORS AND ALCOHOL USE

Personality Characteristics

Personality characteristics have been found to play a significant role in the relation between perceived norms of alcohol use and self-reported alcohol use. Results from Ghee and Johnson (2008) showed that emotional intelligence was found to be a significant moderator in the relationship between the perceived norm and alcohol use. Participants scoring low on emotional intelligence had a stronger relationship between the perceived norm and alcohol use than participants scoring high on emotional intelligence. People scoring higher on emotional intelligence may be more independent and less influenced by the perceived norm. Similarly, Cullum, O'Grady, Sandoval, Armeli, and Tennen (2013) reported that perceived social support moderated the relationship between the perceived norm and alcohol use. More specifically, people with low levels of perceived social support were more influenced by the perceived norm.

In a sample of heavy drinkers, Neighbors, Lewis, Bergstrom and Larimer (2006) investigated the role of controlled orientation in the effectiveness of personalized normative feedback to reduce alcohol use among college students. A high score on controlled orientation means that one experiences high pressure from the environment and low choice of one's behavior. Results showed that normative feedback was not effective in lowering alcohol-related negative consequences among those participants with low controlled orientation. However, for participants with high controlled orientation, normative feedback did reduce alcohol-related negative consequences. Similarly, results from Chawla et al. (2009) showed that controlled orientation was positively associated with number of drinks per week and this relationship was

mediated by the perceived friend injunctive norm of problematic drinking. High controlled orientation is more likely to guide one's own behavior to the pressure of the social environment. Nguyen and Neighbors (2013) reported that controlled orientation was positively associated with alcohol use for Whites, but not Asian-Americans. Nguyen and Neighbors suggest that Asian-Americans are less likely to drink due to social pressures and more likely to drink due to academic pressures in comparison to Whites.

Neighbors, Fossos, et al. (2007) reported that the relationship between the perceived descriptive norm and alcohol use was stronger for participants with high social anxiety. Social anxiety is when people are fearful of being negatively evaluated by others in a social situation. A reasonable way of coping with this is to mimic others in the social situation. Similarly, Terlecki, Buckner, Larimer, and Copeland (2012) reported that a social norms intervention was less effective in reducing perceived norms of peer alcohol use among a sample of participants with high social anxiety in comparison to low social anxiety. Participants with high social anxiety are assumed to be more vigilant in their observations of others during social situations and might be more confident in their estimates of the perceived norm based on their observations. A high level of confidence in the perceived norm would make it difficult to manipulate within a social norms marketing campaign.

In conclusion, personality factors are often overlooked when designing a social norms marketing campaign to reduce college alcohol use. However, some personality factors are relevant in predicting college alcohol use such as emotional intelligence, social anxiety and controlled orientation. The influence of these personality factors on college alcohol use can be amplified during the first year of college when students attempt to fit into a new environment and establish new social relationships.

Methodological Considerations: Control variables

Hypothesis 1a, 1b, and 1c predicted that the perceived injunctive norm will explain additional variance in self-reported heavy alcohol use beyond the descriptive norm and control variables. The control variables that have already been shown to be associated with college alcohol use are socioeconomic status (SES), precollege alcohol use, year in school, gender and race/ethnicity.

Socioeconomic status. SES has been shown to be positively correlated with college alcohol use (Presley, Meilman, & Leichliter, 2002). One reason for differences in alcohol use across SES is that it costs money to buy alcohol. Parsons and Stephenson (2013) reported that the cost of alcohol was correlated with intention to consume alcohol among college students in Australia and New Zealand. Presley et al. (2002) reported that increases in taxes on alcohol were more influential on college alcohol use than were increases in the legal drinking age. These results were based on correlational data when the legal drinking age varied from state to state in the United States. Finally, commuter students, defined as living with parents or relatives, have been found to drink significantly less than residence hall students and students who live in off-campus apartments (Cooney & Nonnamaker, 1992; Jones, Harel, & Levinson, 1992; Sessa, 2005). SES is a possible contributor to that finding because commuter students are often lower SES than resident students, because it costs more to live in the residence halls on campus (Cooney & Nonnamaker, 1992). In conclusion, SES is a factor that students bring with them to college and has been found to be positively associated with college alcohol use.

Precollege alcohol use. Alcohol use in high school is significantly positively correlated with alcohol use in early adulthood (Bachman, O'Malley, & Johnston, 1984; Leibsohn, 1994; Newcomb & Bentler, 1987; Sher & Rutledge, 2007). Baer et al. (1995) and Lo and Globetti

(1995) reported that students who drank heavily in high school self-select into heavy drinking environments in early adulthood such as Greek membership. Similarly, Varvil-Weld, Malett, Turrisi, Cleveland & Abar (2013) found that engaging in high-risk drinking in the summer before college was significantly associated with negative consequences of alcohol use in college.

While high school drinking patterns will differ between college students, the extent to which they differ should be relatively moderate. This is because heavy drinkers in high school are less likely to go to college than light drinkers (Newcomb & Bentler, 1985; O'Malley & Johnston, 2002). More specifically, Bachman et al. (1984) reported that alcohol use during senior year of high school was significantly correlated with alcohol use at one year post high school r=.70, two years post high school r=.65 and three years post high school r=.58. These results illustrate that the relationship between high school alcohol use and early adult alcohol use slowly decreases with each year post high school. In conclusion, precollege alcohol use may be an important predictor in first year college alcohol use. However, the predictive value of precollege alcohol use on college alcohol use will decrease as each year of college passes.

Year in school. First and second year students have been found to engage in heavy episodic drinking more often than third and fourth year students (Jones et al., 1992; Wechsler et al., 2000). More specifically, Rickwood, George, Parker, & Mikhailovich (2011) reported 52.8% of first-year students, 48.6% of second year students and 39.7% of third year or more students to drink at a harmful level. LaBrie et al. (2010) identified first-year college students at increased risk for problematic alcohol use. Lewis and Neighbors (2006) suggest that being a first-year student and living in the residence halls both independently put a student at increased risk for problematic alcohol use.

Turrisi, Padilla and Wiersma (2000) measured alcohol use patterns among three different groups of students which included traditional first-year students, non-traditional first-year students, and traditional upperclassmen. The mean age for the three groups was 18.24 for traditional first-year students, 22.12 for non-traditional first-year students, and 23.26 for traditional upperclassmen. Results showed that the drinking patterns of non-traditional first-year students were more similar to traditional first-year students than traditional upperclassmen. This suggests that year in school may be more influential on alcohol use than age. Theory suggests that first-year students desire to fit into a new social environment, regardless of age.

Gender. Previous research has demonstrated that men consume more alcohol than women (Benton et al., 2006; Capone, Wood, Borsari, & Laird, 2007; Piane & Safer, 2008; Prince & Carey, 2010) and men believe their peers consume more alcohol than women (Benton et al., 2006; Piane & Safer, 2008; Prince & Carey, 2010). Rimal and Real (2005) reported that alcohol use intentions were higher among females than males. However, this effect was found only after controlling for the perceived descriptive and injunctive norm. This suggests that men may consume more alcohol because they have higher perceived descriptive and injunctive norms. Additionally, Iwamoto, Cheng, Lee, Takamatsu and Gordon (2011) found alcohol use to be significantly positively correlated with masculine norms such as having multiple sexual partners, winning at all costs, and risk taking.

Social norms interventions have been found to be more effective on women than men (Carey, Henson, Carey, & Maisto, 2009; LaBrie, Hummer, Grant, & Lac, 2010; Larimer et al., 2007; Neighbors, Lewis, et al., 2010). According to the meta-analysis of 23 studies conducted by Borsari and Carey (2003), women overestimate both the descriptive norm and injunctive norm to a larger extent than men.

Race/Ethnicity. White college students have been found to be more likely to engage in heavy episodic drinking (Pedersen & LaBrie, 2008; Wechsler, Dowdall, Davenport, & Castillo, 1995; Wechsler, Dowdall, Davenport, & Rimm, 1995) and more likely to participate in drinking games than non-White students (Pedersen & LaBrie, 2008). O'Malley and Johnson (2002) reported this effect to be consistent at four different time points from 1992-1999.

Methodological Considerations: Operationalization of alcohol use.

The most common way to measure alcohol use among college students comes from two items from the Daily Drinking Questionnaire (Collins et al., 1985): 1) a frequency question that asks participants to indicate how many days they drank alcohol in a typical week within the past 30 days or 90 days; and 2) a quantity question that asks participants to indicate the typical number of drinks consumed on a typical drinking occasion. A score of total drinks per typical week is calculated by multiplying the two items (Pederson, Neighbors, & LaBrie, 2010).

Instead of multiplication, other researchers have used addition to compute a total "drinks per week" score. A chart is provided for each day of the week and participants are asked to write down the typical number of drinks consumed on each night of the week within the past 30 or 90 days (Neighbors et al., 2010). The number of drinks per night for the total number of nights is summed to get a total score for "drinks per week." However, on this type of alcohol use measure a participant who has seven drinks on Friday night (heavy-episodic drinking) and a participant who has one drink daily (non-heavy episodic drinking) would be indistinguishable. Most colleges and universities target the reduction of heavy-episodic drinking via social norms marketing campaigns ("most students, drink 4 or less"). This is problematic for the "drinks per week" measure because it is not able to accurately measure the target behavior (4 or less in a single sitting). For example, Quinn and Fromme (2011) used the daily drinking questionnaire in

regard to drinking over the past three months. Results showed that non-college students reported drinking significantly less than college students, but non-college students reported significantly more alcohol-related negative consequences. How is it possible that non-college students are drinking less but experiencing more alcohol-related negative consequences? This most likely happened because non-college students were drinking less often, but more drinks per occasion.

McGinley and Curran (2014) advise against using an alcohol measure that multiplies typical frequency by typical number of drinks, even though they are extremely popular, because of validity concerns. Quantity multiplied by frequency measures can underestimate, overestimate, shift relative rank and inaccurately represent patterns of drinking. Similarly, Greenfield and Kerr (2008) state that quantity multiplied by frequency measures of alcohol use only have one advantage, simplicity.

Despite the many problems of trying to measure alcohol use in general, there seems to be more consistency and agreement when trying to measure heavy alcohol use. The most common single item to measure heavy alcohol use is the number of times one has five drinks or more in a row over the course of the past two weeks. The term, "in a row" is used to denote a non-specific lapse of time for a drinking episode (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). The original time interval of two weeks has been modified to 30 days (DeMartini et al., 2011) and three months (Corbin et al., 2011). This question is used in the Monitoring the Future Study (Johnston, O'Malley, Bachman, & Schulenberg, 2008) and the CORE alcohol and drug survey (Presley, Harrold, Scouten, Lyerla, & Meilman, 1994). In the present study the construct of heavy alcohol use was measured by combining three individual questions. The first question was, "*During the last 30 days, on how many days did you have five or more drinks with alcohol in a three to five hour period?*" A common second item for measuring heavy alcohol use is the

number of times/days one drank to the point of drunkenness (Corbin et al., 2011; Ray et al., 2009; Sher & Rutledge, 2007; Testa et al., 2009; Turrisi et al., 2007) such as a similar question used in the present study, "*How many times in the last 30 days did you get drunk?*" A third common item for measuring heavy alcohol use is the typical number of drinks per occasion (Boyle & Boekeloo, 2009; Corbin et al., 2011; LaBrie et al., 2008; Pedersen et al., 2008). The present study utilized a similar question, "*When you go out and socialize or party and drink alcohol, how much do you typically consume per event?*"

According to Greenfield and Kerr (2008) frequency of heavy drinking or quantity per occasion measures have been critical measures in drinking pattern measurement for many years, despite that fact that they have not been very popular over the past 10 years. Greenfield and Kerr (2008) also state that subjective drunkenness is a good measure of intoxication levels because it accounts for factors related to metabolism. It was also stated that frequency of drunkenness has been a better predictor of outcomes like criminal behavior than several other heavy drinking measures. Although the main weakness is that it is subjective in nature, it can be very useful as a supplement to more objective measures of alcohol use patterns. In the present study, a heavy alcohol use composite score was created by combining subjective drunkenness with frequency of heavy drinking and quantity per occasion. Lastly, Huang, Dejong, Schneider, and Towvin (2006) recommend summing the z-scores of multiple drinking items to properly measure heavy alcohol use among college students, which was implemented in the present study.

Limitations

Investigating the relationship between perceived norms and behavior within the context of college alcohol use does not come without limitations. A few studies will be discussed that are believed to highlight some of the limitations within this body of research.

Lab studies. Lombardi and Choplin (2010) argued that participants given normative feedback do not actually change their behavior, but instead change their self-reported behavior. Lombardi and Choplin (2010) gave participants normative feedback in a lab setting and then asked the participants how much alcohol they consume in an average week (past behavior). Participants received a high norm, low norm or control message. Results from experiment one showed that participants in the low norm group reported consuming 4.28 drinks, control, 6.9 drinks, and the high norm group, 7.44 drinks, in an average week. This effect was replicated in two additional lab studies. This is problematic because students' self-reported past behavior should not change as a result of the normative information given.

A second limitation to normative experiments in the lab is that personalized normative feedback sometimes only reduces alcohol use among binge drinkers and not regular drinkers (Cunningham & Wong, 2013). Personalized normative feedback is more likely to be successful with heavy drinkers than light drinkers because there is a larger discrepancy between the norm and behavior for heavy drinkers than light drinkers. Someone who consumes nine drinks per occasion (heavy drinker) is more likely to reduce their drinking than someone who consumes four drinks per occasion after both learning that the norm is four drinks or less per occasion. As a result, the personalized normative feedback approach is typically only effective with heavy drinkers.

Pedersen, LaBrie, and Lac (2008) argued that collecting survey data from large groups of college students at once is problematic. Researchers surveyed participants who belonged to a college organization, including both Greek and non-Greek organizations. Participants completed a survey online (assumed alone) or with other members of their group present. Even though the surveys in both conditions were anonymous, the perceived injunctive norm and perceived

descriptive norm of their reference group's alcohol use increased in the group assessment in comparison to the individual assessment. This suggests that there may be some validity concerns regarding perceptions of peer alcohol use, when surveying large groups of college students in the same room at the same time. An increase of students' perceptions of peer alcohol use was associated with the physical presence of their peers.

Self-reported alcohol use is also subject to social desirability bias because the act is illegal for college students under 21 years of age. If students feel as though they might receive punishment for self-reporting alcohol use, then they will not be honest with their answers. Thombs et al. (2007) reported that rumors were spreading among students suggesting that they could get in trouble with parents and/or university staff by self-reporting alcohol use on the experimental surveys. This also occurred on a campus where alcohol was not banned and very much part of the college and community culture. Wechsler, Seibring, Liu, and Ahl (2004) state that there is scientific evidence of restricting alcohol access (banning) to be effective in promoting abstinence and reducing heavy drinking. However, lower rates of alcohol use on campuses that ban alcohol use might occur because students might be afraid to be truthful. When collecting alcohol use data from students, colleges need to communicate with students that they will not be penalized for survey data, especially on campuses that ban alcohol.

Field studies. Borsari and Carey (2003) argue questions that are more general in nature produce larger self-other-discrepancies (SOD's). According to the meta-analysis of 23 studies specific questions resulted in smaller SOD's and more general questions resulted in larger SOD's. As a result, researchers may be falsely identifying larger misperceptions with questions that are more general. In order to properly evaluate the overestimation of alcohol norms among

college students, the questions need to be as specific as possible so students have an accurate understanding of the question.

In order for a social norms intervention to be effective it is also suggested that the students should have an accurate understanding of the purpose of the campaign. Thombs, Dotterer, Olds, Sharp, and Raub (2008) conducted a campus-wide social norms campaign and reported that only 38.5% of the post intervention sample understood the purpose of the campaign. Additionally, Granfield (2005) reported that only 51% of students believed the statistics of a failed social norms campaign on campus. Granfield claimed that the source of disbelief came from fraternity protest stating that the campaign was aimed to create a more positive image of the school and not scientific research.

Campo, Cameron, Brossard and Frazer (2004) argue that social norms messages change judgments but not attitudes. This is problematic because the authors also argue that attitude change is needed for behavior change. Perhaps a change in judgment reflects a change in the perceived descriptive norm only. Maybe this is why a social norms marketing campaign that focuses on the descriptive norm only may get a reduction in overestimations of alcohol use, but not self-reported alcohol use. Secondly, perhaps a change in attitude reflects a change in the perceived injunctive norm, because the injunctive norm focuses on approval, which is similar to an attitude.

Melson, Davies, & Martinus (2011) gave participants one of three different surveys measuring perceived norms of alcohol use and self-reported alcohol use. One survey only included self-reported alcohol use, one survey only included perceived norms of alcohol use and one survey included both self-reported alcohol use and perceived norms of alcohol use. It was hypothesized that self-reported alcohol use and perceived norms of alcohol use would be higher

in the survey that asked both questions in comparison to the survey that only asked one. Neither hypothesis was supported. As a result, researchers do not need to be overly concerned about the method that they use to collect their survey data on perceived norms and alcohol use.

Summary

Changing behavior (estimating the length of a line) with norms from classic studies such as Asch (1956) has generalized well to the real world including social norms marketing campaigns to reduce college alcohol use (DeJong et al., 2009; Haines & Barker, 2003). Social norms marketing campaigns aim to reduce overestimations of peer alcohol use in hopes that reductions in self-reported alcohol use will follow. The FTNC suggests that behavior change is most likely when the descriptive norm (what most others do) and injunctive norm (what most others approve of) are illustrated in the same direction. While many campaigns highlight the descriptive norm (how much most other students drink) many campaigns fail to illustrate the injunctive norm (how much other students approve of drinking). Another component of the FTNC is that norms need to be salient to change behavior. Previous research has argued that norms for alcohol use are salient in college (Dejong, 2010; Martens et al., 2006) which could be a possible reason for the moderate success of social norms marketing campaigns. Some campaigns have been more successful with women than men (Carey et al., 2009; LaBrie et al., 2010; Larimer et al., 2007; Neighbors et al., 2010) possibly because women have larger overestimations of peer alcohol use (Borsari & Carey, 2003). Lastly, social norms marketing campaigns have been more successful if implemented over longer periods of time (Haines & Barker, 2003; Turner et al., 2008). It is difficult to change the drinking culture of a college and any changes that do occur should be predicted to be slow.

CHAPTER IV

HYPOTHESES

Hypotheses

In the present study, a total of eight hypotheses were tested. The first six hypotheses are variations of hypotheses tested in previous research. However, they are considered unique because the dependent variable is heavy alcohol use and not typical drinks per week. The last two hypotheses are considered to be exploratory and unique because they have not been tested in previous research. All variables were self-reported including heavy alcohol use. All perceived norms are perceived norms of CSU students regarding heavy alcohol use unless otherwise stated.

Hypothesis 1a. In a cross-sectional hierarchical regression analysis conducted on Fall 2008 survey results, the perceived injunctive norm was hypothesized to be a significant positive predictor of fall heavy alcohol use (FHA), beyond the perceived descriptive norm and other covariates. The regression analysis is hierarchical because theory was used to build the model. Based on the Focus Theory of Normative Conduct, the perceived injunctive norm is an important second predictor of behavior beyond the perceived descriptive norm (See Figure 1). Larimer et al. (2004) reported that the perceived injunctive norm predicted additional variance in future alcohol use beyond the perceived descriptive norm. This analysis is important because many social norms marketing programs focus on the descriptive norm only.

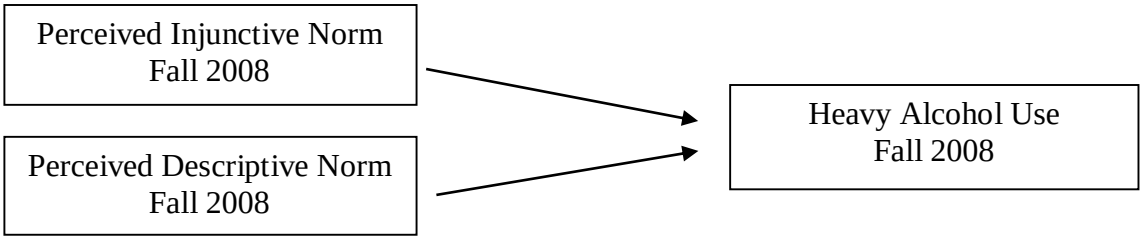

Figure 1. Fall perceived norms predicting fall heavy alcohol use.

Hypothesis 1b. In the same cross-sectional hierarchical regression analysis, it was predicted that the interaction term between the perceived injunctive norm and perceived descriptive norm in predicting FHA would not be significant. Previous researchers have hypothesized that the positive correlation between the perceived descriptive norm and college alcohol use is stronger for participants with a high perceived injunctive norm, but lacks supporting evidence (Rimal, 2008; Rimal & Real, 2003; Rimal & Real, 2005). As a result, it was predicted that the combined effect of the perceived injunctive norm and perceived descriptive norm to predict heavy alcohol use is additive and not multiplicative. More specifically, the interaction term between the perceived injunctive norm and perceived descriptive norm in predicting FHA was predicted to be not significant.

Hypothesis 1c. In a longitudinal hierarchical regression analysis, it was predicted that the perceived injunctive norm from fall would be a significant predictor of spring heavy alcohol use (SHA), beyond the perceived descriptive norm from fall and other covariates (See Figure 2).

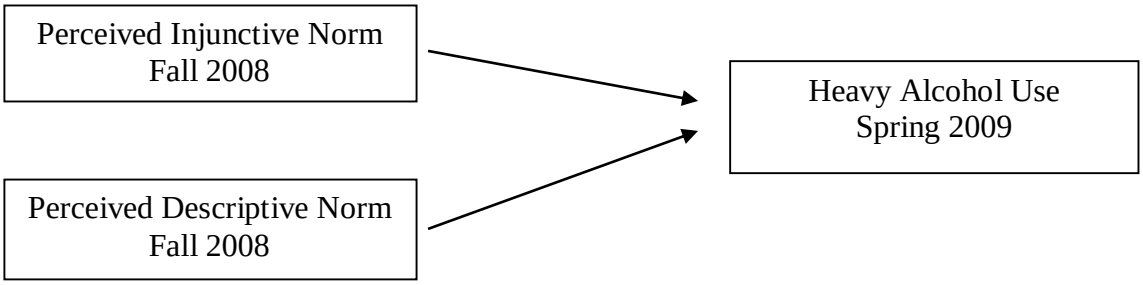

Figure 2. Fall perceived norms predicting spring heavy alcohol use.

Hypothesis 1d. In the same longitudinal hierarchical regression analysis as Hypothesis 1c, it was predicted that the interaction term between the perceived injunctive norm from fall and the perceived descriptive norm from fall in predicting SHA would not be significant.

Hypothesis 1e. In a longitudinal hierarchical regression analysis, it was predicted that the perceived injunctive norm from fall would be a significant predictor of alcohol consequences in spring (SCN), beyond the perceived descriptive norm from fall and other covariates (See Figure 3).

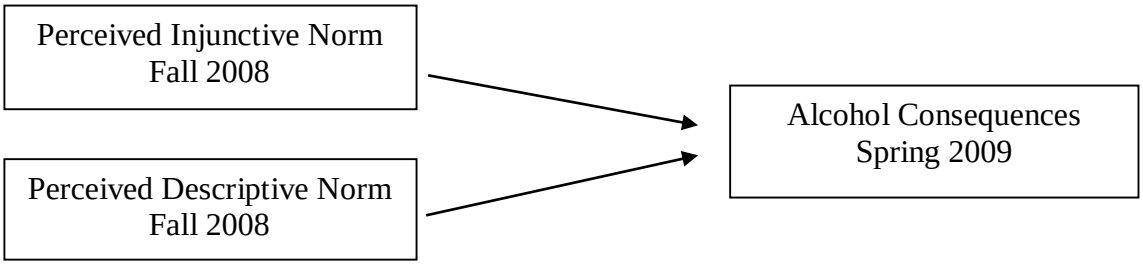

Figure 3. Fall perceived norms predicting spring alcohol consequences.

Hypothesis 1f. In the same longitudinal hierarchical regression analysis as Hypothesis 1e, it was predicted that the interaction term between the perceived injunctive norm from fall and

the perceived descriptive norm from fall in predicting alcohol consequences in spring would not be significant.

Hypothesis 1a is cross-sectional and Hypothesis 1c is longitudinal. If Hypothesis 1a is supported it could be concluded that the perceived injunctive norm and heavy alcohol use are positively correlated. However, there would be no information as to the order of the relationship. Because Hypothesis 1c is longitudinal, if supported, it could be concluded that the perceived injunctive norm at time one predicts heavy alcohol use at time two. However, it cannot be concluded that the relationship is causal because there still could be a third variable that explains the relationship between the two variables.

If Hypotheses 1b and 1d are supported it can be concluded that the combined effect of the perceived injunctive and descriptive norm in predicting heavy alcohol use is additive and not multiplicative. If Hypotheses 1e and 1f are supported the same idea is supported in the prediction of alcohol consequences instead of heavy alcohol use.

Hypothesis 2. The second hypothesis in the present study was the relationship between the perceived norms (descriptive and injunctive) with heavy alcohol use would be significantly stronger for women than men. This prediction was tested once in each of the three regression analyses. It was hypothesized that the relationship between perceived norms and heavy alcohol use would be stronger for women than men (See Figure 4). This prediction is based on cultural stereotypes that men are more independent and women are more interdependent (Eagly & Steffen, 1984). An interaction term for the perceived injunctive norm and gender was entered into all three hierarchical regressions along with an interaction term for the perceived descriptive norm and gender in predicting heavy alcohol use in fall and spring and alcohol consequences in spring.

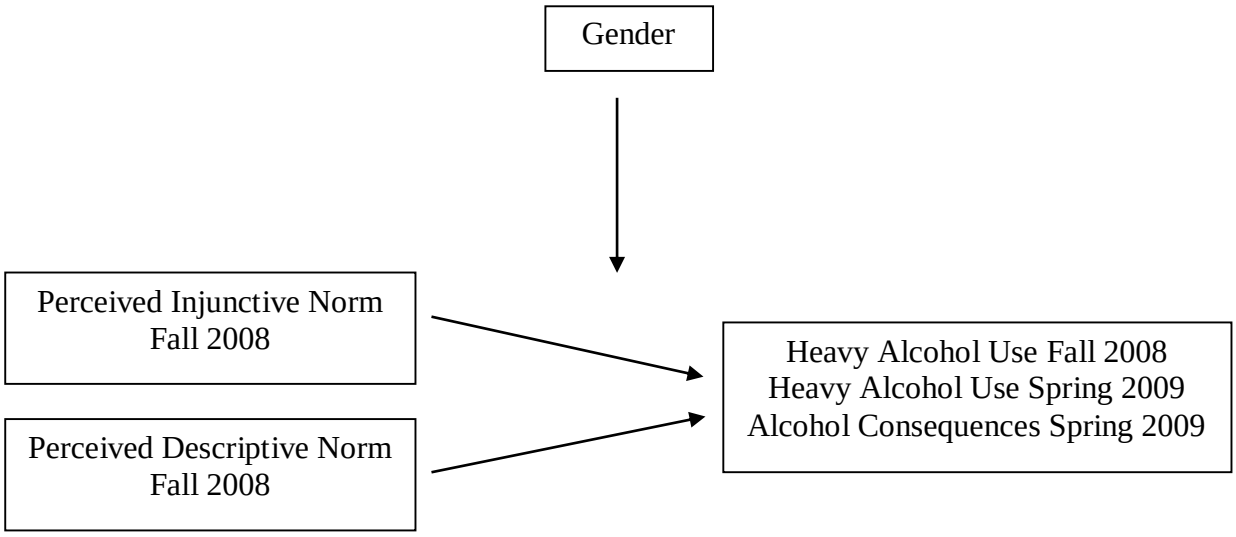

Figure 4. Fall perceived norms predicting alcohol outcomes moderated by gender.

Hypothesis 3. The third hypothesis for the present study was that the perceived descriptive norm would be a better predictor than the perceived injunctive norm for current heavy alcohol use. However, the injunctive norm would be a better predictor than the perceived descriptive norm for future heavy alcohol use. Larimer et al. (2004) reported that when predicting current alcohol use, the perceived descriptive norm was a significant predictor and the perceived injunctive norm did not add additional explained variance. In contrast, when predicting future alcohol use one year later, the perceived descriptive norm was not a significant predictor and the perceived injunctive norm did add additional explained variance. The prediction for the present study is slightly different in that both norms are predicted to be significant for both current heavy alcohol use (FHA) and future heavy alcohol use (SHA), but with a difference in magnitudes. A theoretical reason for this effect reported by Larimer et al. (2004) is that the perceived injunctive norm may be related to group identity. This is based on the assumption that

our group identity (approval of alcohol use) is more stable over time than our individual behavior (alcohol use).

Hypothesis 4. Consequently, the fourth hypothesis for the present study was that the positive correlation between the perceived descriptive norm and heavy alcohol use would be stronger for more proximal than distal groups. We assessed descriptive norms for groups that varied in their proximity to our participants: students in their own and other residence halls, friends, typical CSU students, typical University of Colorado (CU) students, typical University of Wyoming students, 'freshmen' and seniors. Previous research has shown that self-reported alcohol use is more strongly associated with perceived norms of more proximal groups than distal groups (Cho, 2006b; Trockel et al., 2008).

Six different analyses were conducted with six different predictions within hypothesis (Hypothesis 4a - Hypothesis 4f). The first five analyses, Hypothesis 4a – Hypothesis 4e, included fall variables only. Hypothesis 4f included variables from the spring. Hypothesis 4a, the perceived descriptive norm of CSU students is more strongly correlated with heavy alcohol use than the perceived descriptive norm of CU students. Hypothesis 4b, the perceived descriptive norm of CSU students is more strongly correlated with heavy alcohol use than the perceived descriptive norm of University of Wyoming students. Hypothesis 4c, the perceived descriptive norm of one's own residence hall is more strongly correlated with heavy alcohol use than the perceived descriptive norm of other residence halls. Hypothesis 4d, perceived alcohol use attitudes of friends are more strongly correlated with heavy alcohol use than perceived alcohol use attitudes of the typical student. Hypothesis 4e, for first-year students only, during the fall semester the perceived descriptive norm of other first-year students will be more strongly correlated with heavy alcohol use than the perceived descriptive norm of seniors. In the only

exception to the proximity hypotheses, Hypothesis 4f states that for first-year students only, during the spring semester the perceived descriptive norm of seniors will be more strongly correlated with heavy alcohol use than the perceived descriptive norm of first-year students. This is because after being on campus for one semester, first-year students learn that the social status of seniors on campus is much higher than first-year students. In an effort to seek higher social status, first-year students will mimic the behavior of others with more social status (seniors) including heavy alcohol use.

Hypothesis 5. The fifth hypothesis of the present study was that perceived norms and heavy alcohol use are higher in the first semester of college in comparison to retrospective high school measures and second semester of college. Students arrive on campus with incorrect overestimations of college alcohol use and perceived norms. It is suggested that after being on campus for a semester they reduce their perceived norms and heavy alcohol use. This hypothesis was separated into three specific predictions. In Hypothesis 5a heavy alcohol use and perceived norms were hypothesized to be higher in fall than retrospective high school. In Hypothesis 5b, heavy alcohol use, perceived norms, and future intentions were predicted to be lower in spring than fall. In Hypothesis 5c, quantity per event for alcohol use was predicted to decrease from fall to spring, but only for non-drinkers in high school. A median split was conducted on retrospective high school alcohol use, creating a group of non-drinkers and a group of drinkers for high school. Baer (1994) reported that participants' perceived peer disapproval of daily and weekend drinking increased from fall to spring among first-year students. Similarly, Lee et al. (2010) reported that perceived frequency of negative consequences decreased from 3.15 to 2.85 among sophomores from fall to spring.

Hypothesis 6. The sixth hypothesis of the present study was that the relationship between perceived norms and heavy alcohol use in college would be stronger than the relationship between perceived norms and alcohol use in high school. Hypothesis 6a includes the perceived descriptive norm and Hypothesis 6b includes the perceived injunctive norm. The FTNC states that norms are most influential when they are salient. Previous research suggests that perceived alcohol use norms are more salient in college than in high school because alcohol use plays a very large role in the college culture and lifestyle (Martens, et al., 2006). More specifically, universities sell shot glasses in the bookstore (DeJong, 2010), resident assistants give students training on how to not get caught drinking (Rubington, 1990), and "teen movies" depict the theme of college life to focus more on alcohol than academics (Cin et al., 2009).

Hypothesis 7. The seventh hypothesis of the present study was exploratory in trying to predict the perceived injunctive norm in spring from variables in fall. It was predicted that heavy alcohol use, alcohol consequences, gender, year in school, personal attitude toward drinking, and parental approval of getting drunk would account for significant explained variance beyond the perceived descriptive norm in the prediction of the perceived injunctive norm in spring. This hypothesis also investigated the order of the relationship between heavy alcohol use and alcohol consequences with the perceived injunctive norm because heavy alcohol use and alcohol consequences were measured before the perceived injunctive norm.

Hypothesis 8. The eighth hypothesis of the present study was exploratory in trying to predict the perceived descriptive norm in spring from variables in fall. It was predicted that heavy alcohol use, alcohol consequences, gender, and year in school, would account for significant explained variance beyond the perceived injunctive norm in the prediction of the perceived descriptive norm in spring. Prince and Carey (2010) showed that injunctive norm

feedback was able to significantly reduce the perceived injunctive norm and perceived descriptive norm of alcohol use for the typical student. This result demonstrates that if you provide data on the injunctive norm, it has the ability to also change the perceived descriptive norm. Lastly, this hypothesis investigated the directionality of the relationship between heavy alcohol use and alcohol consequences with the perceived descriptive norm because heavy alcohol use and alcohol consequences were measured before the perceived descriptive norm.

CHAPTER V

METHOD

Participants

A total of 865 students participated in the study in Fall 2008. All participants were students at CSU and lived in the residence halls on campus. The participants were 63% female, 85% White, 77% in-state and 78% first-year students. Of those 865 participants, a total of 506 participants completed a second survey in Spring 2009. The participants closely matched the full sample (63% female, 85% White, 78% in-state, and 68% first-year students). The only characteristic that varied from time one to time two was self-reported year in school. The percentage of students who reported first-year status decreased by 10% from fall to spring. However, this was expected because students who came to CSU with college credit may achieve academic sophomore status by their second semester. Additionally, based on University records, 6% of the first-year Fall 2008 class was not enrolled at CSU in Spring 2009, which was also consistent with the average attrition rate over the last 18 years.

Procedure

Data were collected from participants during the semesters of Fall 2008 and Spring 2009. The fall survey included a total of 153 questions and was sent via email to a random sample of 1,500 students from a list of approximately 5,200 students who lived in the residence halls on campus. Once participants completed the survey they were instructed to fill out a participant compensation form to receive a $10 i-tunes™ gift card. All students who did not complete the participant compensation form within two weeks after receiving the initial email invitation to participate were sent a reminder e-mail. A second reminder email was sent approximately four weeks after the initial email that invited the students to participate. All 865 participants in spring

were given a second $10 i-tunes™ gift card, regardless of whether they completed the survey or not. The survey took most students approximately 15-20 minutes to complete.

A total of 865 participants completed the survey in Fall 2008. A total of 506 students completed the survey in Spring 2009. Some participants were removed from the data set due to incomplete data and random responding for a final sample of 713 in Fall 2008 and 465 in Spring 2009. Thus, the response rate for fall was 713 out of 1500 invitations, or 47.5%, and for Spring 2009 it was 465 responses out of 713, or 65.2%.

Of the 465 students who participated in Spring 2009, a total of 330 were able to be successfully matched to Fall 2008 surveys for a match rate of 330/465 (71%) or 330/713 (46.3%). Not all participants were able to be matched because the University's IRB prohibited the research team from assigning participants a unique ID code. A total of twelve questions were used to match participants' fall and spring surveys: a) last three digits of their phone number, b) favorite movie snack, c) favorite super hero, d) favorite song, e) favorite ice cream topping, f) major, g) gender, h) ethnicity, i) in-state tuition, j) first generation college student, k) residence hall, and l) went to high school within 25 miles of the University. In order to determine a match, participants needed to match on the last three digits of their phone number, all demographic questions (f through l) and two out of the four favorites questions (b through e). However, a small number of exceptions were made. The most common exception was for major and residence hall because they were able to change from time one to time two. In addition, some matches were made with fewer than two matches on the four questions about favorites if the last three digits matched along with all the demographic information.

Materials

The Fall 2008 survey included 153 items. The Spring 2009 survey was identical with three additional items. The spring survey included one additional question regarding weekly exercise (S8) and two items regarding perceived approval of alcohol use among college students (S106 & S107). In addition to demographics and questions used for tracking purposes, participants were asked questions about their high school alcohol use, high school perceived norms, current alcohol use, locations where students consume alcohol, perceptions of peer alcohol use, safe drinking practices, negative consequences from alcohol use, social/cognitive effects of alcohol, attitudes toward alcohol use, perceptions of parental attitudes toward alcohol use, and perceptions of friend attitudes toward alcohol use. For the complete survey see Appendix A.

Social Norms Marketing Campaign and Residence Halls. A social norms marketing campaign was implemented during Fall 2008 and Spring 2009 in the residence halls on the campus of Colorado State University. The manipulation consisted of posters displayed in the residence halls. A total of five out of the eleven residence halls received the posters. The remaining 6 residence halls served as a control and did not receive any posters. Residence halls were not randomly assigned to treatment and control. Residence halls with higher levels of alcohol use were assigned to the treatment condition. A social norms poster with an injunctive norm, "96% of CSU Freshmen don't think it is right to drink alcohol when it interferes with academic and other responsibilities" was placed in every room of the treatment halls. Six additional posters illustrating different descriptive norms were made available for students to take for free during the first week of moving into the treatment residence halls. The six different posters had a different descriptive norm for a majority of students consuming three, four or five

drinks or less when they socialize at a party. The effectiveness of the campaign was evaluated as part of a larger study (Cross, 2010). However, the present study was not designed to evaluate the effectiveness of the campaign. In an effort to account for variance associated with a possible effect of the social norms marketing campaign on heavy alcohol use, residence halls were entered into the regression equation as a covariate.

Measures

Operationalizing heavy alcohol use. Three items were used to create a heavy alcohol use scale (see Table 1). All three items were standardized into z-scores and the mean was calculated from the three z-scores to create a scale score of heavy alcohol use. The three alcohol use items were also used individually in additional analyses.

Table 1
Heavy alcohol use items

Item #	Heavy Alcohol Use Questions and Responses
F25/S26	When you go out and socialize or party and drink alcohol, how much do you typically consume per event? (A drink is defined as a 12 oz. beer 12 oz. malt beverage, a 12 oz. wine cooler, 5 oz. glass of wine, a mixed drink, or a shot of liquor.) Responses: 1-2 drinks, 3-4 drinks, 5-6 drinks, 7 or more drinks, I do not consume alcohol.
F27/S28	During the last 30 days, on how many days did you have five or more drinks with alcohol in a three to five hour per period? Responses: None (have used but not in the last 30 days, 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, all 30 days.
F37/S38	How many times in the last 30 days did you get drunk? Responses: None, 1-2 times, 3-5 times, 6-9 times, 10 or more times.

A single item of frequency of alcohol use in a month was included on the survey, "How many different times have you used alcohol in the past 30 days?" This question was asked for retrospective high school (F16), fall (F26) and spring (S27). As a result, comparisons could be made across the three different time points.

Operationalizing alcohol consequences. The present study also included a second alcohol use DV, alcohol consequences. It is very common to measure both alcohol use and alcohol consequences when investigating the association with perceived norms among college students (Carey et al., 2009; Corbin et al., 2011; Wood et al., 2010). The two most common scales for alcohol consequences are the 23 item Rutgers Alcohol Problem Index (RAPI) and the 48 item Young Adult Alcohol Consequences Questionnaire (YAACQ).

The five alcohol consequence items used in the present study (F78-F82/S79-S83, See Appendix A) are representative of five specific items on the YAACQ. The wording of the stem was, "*Within this semester, have you ever experienced the following situations as a consequence of using alcohol?*" The five situations were: a) passed out from drinking too much, b) forgotten where you were or what you did, c) gotten sick and vomited from drinking too much, d) done something you later regretted, and e) missed a class. Response options for the YAACQ and questions for the present study were dichotomous (yes/no). A yes was scored as a one and a no was scored as a 0 and a total score for the scale was summed. The reliability of the YAACQ has been found to be .90 and above in several studies (Capone et al., 2007; Lewis et al., 2009; Park, Sher, & Krull, 2008). The total score of the YAACQ has been found to be positively correlated with the total score of the RAPI (r=.79), frequency of drinking to intoxication (r=.33) and frequency of heavy episodic drinking (r=.45; Read, Kahler, Strong, & Colder, 2006).

Perceived norms. The perceived injunctive norm was measured by asking participants, "*What percentage of CSU students do you think approve of consuming five or more drinks with alcohol in a three to five hour period?*" Responses were on a one to five scale (less than 20%, 20%-39%, 40%-59%, 60%-79%, 80% or more) or "Don't know." The perceived descriptive norm was measured with the question, "*Overall, what percentage of CSU students do you think*

consume five or more drinks with alcohol in a three to five hour period during a typical month?" Responses were on the same one to five scale (less than 20%, 20%-39%, 40%-59%, 60%-79%, 80% or more) or "Don't know." Participants were asked a very similar perceived descriptive norm question about University of Wyoming and University of Colorado students. Participants were also asked to estimate the perceived descriptive norm for each of the specific CSU residence halls , "*During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period?*". Two perceived descriptive norms were created by residence hall (own residence hall and all other residence halls). Participants were also asked to estimate the perceived descriptive norms for drunkenness for CSU freshmen and seniors, "*During the last 30 days, how often do you think CSU freshmen typically got drunk*?" and "*During the last 30 days, how often do you think CSU seniors typically got drunk*?" Finally, participants were asked to provide a retrospective high school perceived injunctive norm and descriptive norm, respectively, "*What percentage of your high school classmates approved of consuming five or more drinks with alcohol in a three to five hour period?"* and "*In a typical month, what percentage of your high school classmates consumed five or more drinks with alcohol in a three to five hour period, at least once?*

Covariates. The hierarchical regression analysis included a set of covariates in step one. The first covariate was gender with three response options (male, female, transgender). Year in school ("*As of this semester, what is your class standing?")* was the second covariate with four response options (Freshman, Sophomore, Junior, Senior). Retrospective high school alcohol use was the third covariate, *"During your last year of high school, how many times did you use alcohol in a typical month?"* Response options included none, 1-2 times, 3-5 times, 6-9 times,

or 10 or more times. The last covariate was residence hall, "*In which residence hall do you reside?*" with 11 different residence halls listed. Ethnicity, SES and Social Norms Campaign exposure were also tested for potential inclusion in the regression model. Ethnicity was measured with the question, "*How do you identify ethnically/racially?"* SES was measured via financial aid eligibility. Social norms campaign exposure was recorded based on the residence hall measure, there were no cognitive measures of exposure (e.g., memory of the messages) on the survey.

Attitudes and Future Intentions. Hypothesis 4d included two attitudinal items. The first attitudinal item was, "*Which attitude best represents your closest friends?*" Response options included drinking is never a good thing to do; drinking is ok, but a person should never get drunk; occasionally getting drunk is OK, as long as it doesn't interfere with academics or other responsibilities; occasionally getting drunk is OK, even if it interferes with academics or other responsibilities; and frequently getting drunk is OK, if that is what a person wants to do. The second attitudinal item was, "*Which attitude best represents a typical CSU student?*" and had the same response options as the first item.

Similarly, Hypothesis 7 consisted of two attitudinal items. The first item was personal attitude toward drinking, "*Which attitude best describes you?*" The response options were the same as the two attitude questions described above. The second item was parental approval of getting drunk, "*How upset would your parents be if they found out that you had recently gotten drunk?*" again with the same response options as the other three attitude questions.

Finally, Hypothesis 5b involved two single items regarding future alcohol use intentions that were combined to create a composite score for future intentions. The first future intentions item was, "*How do you think your alcohol use will change or not change over the next year? I*

*think that the number of days/months that I have drinks with alcohol will…"*The second future intentions item was, "*How do you think your alcohol use will change or not change over the next year?*". Response options for both questions were increase, decrease or stay the same.

Data Cleaning. Two procedures were conducted to clean the data. One, we wanted to identify any possible participants who were inconsistent with their responses to the alcohol use items. The fall question, "Have you ever had alcohol to drink, more than just a few sips (wine, beer, hard liquor) was used to identify non-drinkers. A total of 160 non-drinkers responded with a response of "no". Of the 160 non-drinkers, not one indicated consuming alcohol on any of the other alcohol use items in fall (F25, F27, F37). This procedure was conducted a second time for spring. A total of ninety-one non-drinkers responded with a "no" to the same question in spring (S22). Similarly, of the ninety-one non-drinkers, not one reported consuming alcohol on any of the other alcohol use items in spring (S26, S28, S38).

The second procedure for cleaning the data was to identify any outliers on the FHA and SHA composites. Any participant who was three or more standard deviations above the mean would be deleted. However, no participants were identified as being three standard deviations above the mean, so no participants were deleted from the data set. The present study was part of a larger governmental project (Cross, 2010) and the data were most likely cleaned before they were received from the larger project.

Abbreviations were created for these measures to better understand the analysis and results. See Table 2 for individual items and Table 3 for composite items.

Table 2
Abbreviations of Individual Items

Item #	Fall Abbreviation	Description of Item	Spring Abbreviation
F16/S17	FRA	Retrospective high school frequency of alcohol use per month	n/a
F17/S18	FRN	Retrospective high school perceived injunctive norm of heavy episodic use	n/a
F18/S19	FRD	Retrospective high school perceived descriptive norm of heavy episodic use	n/a
F25/S26	FQU	Typical number of drinks per event	SQU
F26/S27	FFA	Frequency of alcohol use per month	n/a
F27/S28	FFQ	Frequency of heavy episodic drinking	SFQ
F37/S38	FDK	Frequency of getting drunk	SDK
F44/S45	FDF	Perceived descriptive norm of drunkenness of freshmen on campus	SDF
F45/S46	FDS	Perceived descriptive norm of drunkenness of seniors on campus	SDS
F46/S47-F56/S57	FDI	Perceived descriptive norm of heavy episodic use for individual dorm	n/a
F46/S47-F56/S57	FDO	Perceived descriptive norm of heavy episodic use for other dorms	n/a
F57/S58	FIN	Perceived injunctive norm of peer heavy episodic use	SIN
F58/S59	FDN	Perceived descriptive norm of peer heavy episodic use	SDN
F59/S60	FDW	Perceived descriptive norm of U of Wyoming heavy episodic use	n/a
F60/S61	FDC	Perceived descriptive norm of U of Colorado heavy episodic use	n/a
F86/S87	FAP	Personal attitude toward alcohol use	n/a
F88/S89	FAC	Attitude of closest friends toward alcohol use	n/a
F90/S91	FAT	Perceived attitude of typical CSU student toward alcohol use	n/a
F97/S98	FPD	Would parents be upset if you got drunk?	n/a
F107/S110	FAF	Future intentions of alcohol use (frequency)	SAF
F108/S111	FAQ	Future intentions of alcohol use (quantity per event)	SAQ
F111/S114	GEN	What is your gender?	n/a
F112/S115	ETN	What is your ethnicity?	n/a
F115/S118	SES	Financial Aid?	n/a
F118/S121	YER	What is your year in school?	n/a
F119/S122	RES	What is your residence hall?	n/a
n/a	SOC	Social Norms Campaign Exposure	n/a

Table 3

Abbreviations of Composite Items

Item #	Fall Abbreviation	Description of Item	Spring Abbreviation
F25+F27+F37 or S26+S28+S38	FHA	Heavy alcohol use (3 items)	SHA
F78/S79-F82/S83	FCN	Alcohol Consequences (5 items)	SCN
F107+F108 or S110+S111	FAI	Future alcohol use intentions (2 items)	SAI

CHAPTER 6

RESULTS

Reliability

Cronbach's alpha for the FHA scale was .89 and .89 for SHA. Cronbach's alpha for future alcohol use intentions was .68 for fall and .95 for spring. Kuder-Richardson 20 for the fall alcohol consequences dichotomous scale (FCN) was .76 and .79 for spring (SCN).

Descriptive Statistics

In Fall 2008, the sample consisted of 66.1% first-year students, 11.9% sophomores, 4.4% juniors, 1.9% seniors and 16.1% did not answer. For gender, 31.9% were male, 52.1% female, .2% transgender and 15.7% did not answer. Because only two participants identified as transgender, they were not included in any gender analysis. For race/ethnicity, a total of 72.1% reported as White, 4.1% as Hispanic, 2.4% as Asian/Pacific Islander, 2% multi-racial, 1.5% Black/African-American, 1.5% other, .6% Native American and 15.7% did not answer. In regard to SES, students were asked which of four separate financial aid categories they were able eligible to receive. A total of 15.7% did not answer, among those who did answer, 57% indicated that they received financial aid from at least one category and the overall mean was 1.25 categories. Missing data was treated by using list-wise deletion. An MCAR test was conducted once for the fall variables and once for the spring variables. The fall variables were not missing at random (p=.039). The percentage of missing values from questions regarding perceived norms of students living in other dorms (F46-F56) was 33.66%. It seems plausible that many students saw questions about other residence halls and simply skipped over these questions, instead of reading the questions and indicating "don't know." Even though the fall data was not missing at random, this was not a threat to internal validity. The spring variables were also not missing at

random (p<.001). The percentage of missing values from the SCN was 14.2%. Instead of indicating "no" for an alcohol consequence, many students did not answer. Even though the spring variables were not missing at random, this was not a threat to internal validity.

Means and standard deviations were calculated for all continuous variables of interest for fall and spring and are presented in Table 4. The alcohol use items are presented in Table 4 as unstandardized means in reference to the individual items (F25), (F27) and (F37). However, standardized z-scores were used for creating the composite FHA and SHA scales for all hypothesis testing.

According to the descriptive statistics in Table 4, restriction of range does not appear to be present in FIN (*CV*=41.37) in comparison to FDN (*CV*=37.87) and also not present in SIN (*CV*=40.58) in comparison to SDN (*CV*=40.07). Quantity per event (FQU) was 2.41. A numerical value of two was labeled as "1-2 drinks" and numerical value of three was labeled as "3-5 drinks." As a result, the mean for FQU was most likely somewhere between two and three drinks. The number of typical drinking days per month (FFQ) was 1.92. The numerical value of two represented "1-2 drinks." As result, the mean level of drinking days in a typical month was a little less than one day. The mean number of times getting drunk in a typical month was 1.68. The numerical value of two represented "1-2 times." As a result, the mean number of times getting drunk in a typical month was a little less than one time. The mean for the perceived injunctive norm (FIN) and perceived descriptive norm (FDN) were 2.78 and 2.72, respectively. For both norms questions, the numerical value of two was labeled as 20%-39% and the numerical value of three was labeled as 40%-59%. As a result, the perception of students was that 35% of their peers engage in heavy episodic drinking at least twice within the last two weeks and 35% approve of it.

Table 4

Means and standard deviations for fall and spring variables

Variable	Mean	Scale Range	Standard Deviation	CV	N
FRA	1.88	(1-5)	1.12	59.57	712
FRN	3.09	(1-5)	1.23	39.80	581
FRD	2.94	(1-5)	1.20	40.81	577
FQU	2.41	(1-5)	1.31	54.35	552
FFA	2.04	(1-5)	1.12	54.90	713
FFQ	1.92	(1-7)	1.15	59.90	552
FDK	1.68	(1-5)	1.02	60.71	713
FDF	2.95	(1-5)	.89	30.17	712
FDS	2.91	(1-5)	.98	33.68	712
FDI	2.64	(1-5)	1.32	50.00	575
FDO	2.60	(1-5)	.90	34.62	550
FIN	2.78	(1-5)	1.15	41.37	660
FDN	2.72	(1-5)	1.03	37.87	655
FDW	3.09	(1-5)	1.15	37.22	472
FDC	3.46	(1-5)	1.13	32.66	595
FCN	.37	(1-5)	.94	254.05	713
FAP	2.57	(1-5)	.87	33.85	712
FAC	2.88	(1-5)	.96	33.33	712
FAT	3.15	(1-5)	.71	22.54	712
FPD	2.53	(1-4)	1.01	40.00	689
FAF	2.10	(1-3)	.52	24.76	552
FAQ	2.04	(1-3)	.48	23.53	552
SQU	3.28	(1-5)	.98	29.88	465
SFQ	1.57	(1-7)	1.24	78.98	465
SDK	1.68	(1-5)	.97	57.74	465
SDF	2.90	(1-5)	.84	28.97	465
SDS	2.80	(1-5)	.87	31.07	465
SIN	2.76	(1-5)	1.12	40.58	437
SDN	2.67	(1-5)	1.07	40.07	433
SCN	.92	(1-5)	1.42	154.35	398
SAF	1.66	(1-3)	.95	57.23	465
SAQ	1.61	(1-3)	.89	55.28	465

Correlations were calculated at time one (fall) for all continuous variables of interest and are presented in Table 5. The purpose of the analysis was to identify significant relationships among the variables and help with interpretation of the beta values (partial correlations) in the regression analysis.

Table 5
Correlation matrix for fall variables

VAR	FRA	FRN	FRD	FQU	FFA	FFQ	FDK	FHA	FDF	FDS	FDI	FDO	FIN	FDN	FDW	FDC	FCN	FAP	FAC	FAT	FPD	FAF	FAQ
FRA	-																						
FRN	.35**	-																					
FRD	.32**	.72**	-																				
FQU	.66**	.36**	.28**	-																			
FFA	.70**	.33**	.29**	..76**	-																		
FFQ	.69**	.34**	.27**	.79**	.85**	-																	
FDK	.68**	.30**	.26**	.72**	.84**	.83**	-																
FHA	.73**	.36**	.29**	.89**	.88**	.94**	.93**	-															
FDF	.24**	.29**	.32**	.21**	.27**	.27**	.29**	.28**	-														
FDS	.30**	.29**	.29**	.27**	.30**	.32**	.34**	.33**	.48**	-													
FDI	.40**	.38**	.34**	.42**	.44**	.44**	.42**	.46**	.36**	.27**	-												
FDO	.21**	.35**	.37**	.17**	.20**	.22**	.20**	.21**	.40**	.29**	.49**	-											
FIN	.30**	.57**	.45**	.35**	.32**	.34**	.31**	.37**	.40**	.40**	.40**	.45**	-										
FDN	.30**	.52**	52**	.29**	.30**	.31**	.32**	.34	.48**	.39**	.43**	.52**	.68**	-									
FDW	.24**	.54**	.49**	.23**	.25**	.24**	.23**	.26**	.46**	.37**	.38**	.52**	.60**	.66**	-								
FDC	.16**	.43**	.39**	.17**	.17**	.17**	.20**	.20**	.43**	.36**	.31**	.50**	.51**	.62**	.67**	-							
FCN	.42**	.23**	.21**	.44**	.53**	.55**	.56**	.57**	.15**	.17**	.28**	.20**	.21**	.21**	.06	.10*	-						
FAP	.48**	.25**	.22**	.57**	.53**	.58**	.49**	.56**	.19**	.20**	.27**	.17**	.26**	.26**	.20**	.19**	.32**	-					
FAC	.32**	.22**	.20**	.37**	.34**	.39**	.36**	.38**	.20**	.23**	.21**	.14**	.18**	.19**	.20**	.21**	.24**	.55**	-				
FAT	.00	.08	.12**	-.01	.01	.01	.02	.00	.28**	.17**	.09*	.13**	.23**	.25**	.16**	.24**	.03	.19**	.27**	-			
FPD	-.39**	-.28**	-.23**	-.45**	-.41**	-.43**	-.40**	-.45**	-.18**	.20**	-.24**	-.14**	-.28**	-.27**	-.20**	-.13**	-.21**	-.42**	-.31**	-.05	-		
FAF	.04	.04	.03	.03	.03	.03	.03	.03	.00	.04	-.06	.01	.04	.02	.02	.02	.00	.07	.02	.04	-.11*	-	
FAQ	.06	.06	.03	.08	.10*	.08	.06	.08	.02	.05	.03	.05	.09*	.06	.03	-.02	.04	.10*	.02	.01	-.07	.52**	-
FAI	.05	.06	.04	.06	.07	.06	.05	.06	.01	.05	-.02	.03	.07	.04	.03	.00	.02	.09*	.03	.03	-.10*	.88**	.86**

Note: all *p<.05 are boldfaced, **p<.01

Data from Table 5 showed that FRA was significantly correlated with FHA, *r*=.73. This is consistent with Bachman et al. (1984) who showed that senior year of high school alcohol use was highly correlated with first-year college alcohol use *r*=.70. For the purposes of the present study, this is important because using FRA as a covariate to predict FHA will explain a large amount of variance. As a result, only a small amount of variance will be left for the other covariates and perceived norms to predict FHA. Secondly, FIN was significantly correlated with FDN, *r*=.68. There are some minor concerns for multicollinearity because both variables are being used in the same regression analysis to predict FHA. However, multicollinearity is not considered a problem unless the Variance Inflation Factor (VIF) is above 9 and the Pearson correlations is above *r*=.80. None of the variables in the regression analysis had a correlation above *r*=.80 or a VIF above 9.

Correlations were also calculated at time two (spring) for all continuous variables and are presented in Table 6. The purpose of the analysis was to identify significant relationship among the variables and help with interpretation of the beta values (partial correlations) in the regression analysis.

Table 6

Correlation matrix for spring variables

VAR	SQU	SFQ	SDK	SHA	SDF	SDS	SIN	SDN	SCN	SAF	SAQ
SFQ	.69**	-									
SDK	.59**	.83**	-								
SHA	.84**	.91**	.92**	-							
SDF	.12*	.25**	.24**	.24**	-						
SDS	.20**	.31**	.34**	.32**	.52**	-					
SIN	.34**	.37**	.34**	.38**	.34**	.35**	-				
SDN	.33**	.34**	.32**	.36**	.40**	.41**	.79**	-			
SCN	.47**	.65**	.69**	.70**	.23**	.27**	.30**	.25**	-		
SAF	-.01	.50**	.24**	.27**	.14**	.20**	.24**	.19**	.26*	-	
SAQ	-.03	.54**	.27**	.30**	.15**	.22**	.23**	.19**	.30*	.90**	-
SAI	-.02	.53**	.26**	.29**	.15**	.21**	.24**	.19**	.29*	.98**	.97**

Note: all *p<.05 are boldfaced, **p<.01

Data from Table 6 showed that SHA and SCN are correlated at a high level r=.70, p<.001. Secondly, SIN was significantly correlated with SDN, r=.79, p<.001. However, there were no concerns about multicollinearity because SIN and SDN are not being used as predictors in the same model.

Preliminary Analysis For Hypothesis 1

In an effort to identify covariates for Hypothesis 1, a preliminary analysis was conducted for fall variables only. Based on the literature review the following variables were investigated as possible covariates for hypothesis one; ETN, SES, GEN, YER, SOC, RES, FRA

Race/Ethnicity (ETN). In previous research White college students have been found to be more likely to engage in heavy episodic drinking (Pedersen & LaBrie, 2008; Wechsler, Dowdall, Davenport, & Castillo, 1995; Wechsler, Dowdall, Davenport, & Rimm, 1995). Different non-White ethnicities were collapsed into one group of non-White students because FHA was not significantly different across the various groups of non-White students, $F(5,97)=1.02$, p=.41. As a result, ETN was dichotomized into two groups, White and non-White students and compared on FHA. Results showed that White students (M=-.08; SD=.84; N=610) were not significantly higher on FHA than non-White students (M=.04; SD=.96; N=103), $t(711)=1.27$, p=.21, d=.13. As a result, ETN was not entered into hypothesis 1 as a covariate.

Socioeconomic status (SES). In previous research SES has been shown to be positively correlated with alcohol use in college samples (Presley et al., 2002). Participants were given four financial aid categories and were asked to indicate whether they were eligible for any financial aid for each of the four categories. SES was dichotomized into two groups, students who were eligible for financial aid (i.e., those who said yes to any category) and students who were not eligible for financial aid, and compared on FHA. Results showed that participants who were

eligible for financial aid (*M*=-.10; *SD*=.84; *N*=404) did not drink significantly more than students who were not eligible for financial aid (*M*=-.02; *SD*=.98; *N*=309), *t*(711)=1.30, *p*=.20, *d*=.09. As such, SES was not entered into Hypothesis 1 as a covariate.

Gender (GEN). Because only two participants indicated that they were transgender, the category of transgender was not included in the gender analysis. In previous research men have been shown to consume more alcohol than women (Benton et al., 2006; Capone et al., 2007; Piane & Safer, 2008; Prince & Carey, 2010). Results showed that men (*M*=.19; *SD*=.81; *N*=270) had significantly higher FHA than women (*M*=-.13; *SD*=1.03; *N*=441), *t*(709)=4.65, *p*<.001, *d*=.35. As result, GEN was included in the analysis for Hypothesis 1 as a covariate.

Year in school (YER). The sample was divided into first-year and more advanced students based on fall responses. Results showed that the FHA of first-year students and more advanced students did not differ significantly, *t*(708)=1.89, *p*=.059, *d*=.18. However, the means (first-year students, M=-.03; SD=.93; N=559; advanced students, M=-.19; SD=.81; N=151) were in the direction typically observed in past research. Although the p-value exceeded the threshold for significance, YER was still included as a covariate in Hypothesis 1 because of the large body of previous research suggesting that being a first-year student puts oneself at increased risk for problematic alcohol use (e.g., Jones et al., 1992; LaBrie et al., 2010; Lewis & Neighbors, 2006; Wechsler et al., 2000).

Social norms campaign exposure (SOC) and residence hall (RES). On the CSU campus, participants who were exposed to the campaign in Fall 2008 (*M*=.11; *SD*=.96; *N*=359) self-reported significantly higher FHA than participants who were not exposed to the campaign (*M*=-.11; *SD*=.86; *N*=351), *t*(708)=3.14, *p*=.002, *d*=.24. Additionally, participants who were exposed to the campaign in Spring 2009 (*M*=.06; *SD*=.94; *N*=159) self-reported significantly

higher SHA than participants who were not exposed to the campaign (*M*=-.16; *SD*=.81; *N*=173), *t*(330)=2.32, *p*=.021, *d*=.25.

The designer of the social norms marketing campaign assigned the highest drinking residence halls to the treatment condition (Cross, 2010). This is most likely why the treatment condition scored higher on FHA than the control condition. In the Spring 2009, the pattern of means were very similar to Fall 2008, suggesting no change from fall to spring (see Table 7). It was concluded that the social norms marketing campaign was not effective and did not have a meaningful effect on FHA or SHA. As a result, SOC was not included in Hypothesis 1 as a covariate. However, to account for differences in FHA across different residence halls, RES was entered as a covariate in Hypothesis 1.

Table 7
Heavy alcohol use across residence halls

Residence Hall	Condition	Fall	N	Spring	N
Hall 1	Control	-.51 (.44)	75	-.30 (.69)	41
Hall 2	Treatment	.06 (.93)	58	.23 (1.09)	28
Hall 3	Control	-.13 (.87)	59	-.22 (.75)	27
Hall 4	Treatment	.18 (.98)	121	.06 (.94)	60
Hall 5	Control	.23 (.94)	51	-.13 (.72)	18
Hall 6	Treatment	-.18 (.80)	58	-.38 (.60)	22
Hall 7	Control	-.23 (.81)	50	-.06 (.95)	22
Hall 8	Control	-.07 (.86)	60	-.45 (.59)	35
Hall 9	Control	.22 (1.04)	56	.35 (.98)	30
Hall 10	Treatment	-.01 (.92)	66	.06 (.89)	25
Hall 11	Treatment	.44 (1.06)	56	.29 (.99)	24

Retrospective high school alcohol use (FRA). In the present study, FRA was positively correlated with FHA, r=.73, p<.001 and SRA with SHA, r=.75, p<.001. Additionally, a strong correlation was found between FHA and SHA, r=.75, p<.001. These results suggest that heavy alcohol use was somewhat stable over time which is described in more detail in the next section. As a result, FRA was entered as a covariate in Hypothesis 1.

Cross-sectional data of alcohol use and perceived norms over time

Frequency of alcohol use was slightly lower in retrospective high school (M=1.88 for F16) and fall (M=2.04 for F26) in comparison to spring (M=2.06 for S27). A total of 15.53% of participants identified themselves as "non-drinkers" in fall and 10.95% in spring. The perceived injunctive norm followed an unexpected pattern of peaking in retrospective high school (M=3.09) and remaining stable from Fall 2008 (M=2.78) to Spring 2009 (M=2.76). The perceived descriptive norm followed a similar pattern of peaking in retrospective high school (M=2.94 for FRD) and decreasing slightly in Fall 2008 (M=2.72 for FDN) and Spring 2009 (M=2.67 for SDN).

Attrition Analysis

A MANOVA comparing "stayers" vs. "leavers" was conducted for the following continuous variables: FHA, FCN, FRA, FAI, FDN, and FIN. The purpose of the MANOVA was to assess attrition bias across the six different dependent variables. The overall MANOVA was significant (p=.037).

Three of the six dependent variables were significantly different between stayers and leavers. FRA was significantly higher among leavers (M=2.22; SD=1.25) than stayers (M=2.01; SD=1.07), F(1,508) = 4.06, p=.045, d=.18. FIN was significantly higher (more approval) among leavers (M=2.98; SD=1.16) than stayers (M=2.75; SD=1.12), F(1,508) = 5.11, p=.024, d=.20.

FDN was significantly higher among leavers (M=2.85; SD=1.09) than stayers (M=2.65; SD=.97), $F(1,508) = 4.96$, p=.026, d=.19. Thus, those who failed to complete the study score higher on retrospective high school alcohol frequency, fall perceived injunctive norm and the fall perceived descriptive norm. Differential attrition was also tested across gender and year in school. A chi-square analysis compared the "stayers" vs. "leavers" on the categorical variables (gender and year in school). None of the categorical variables were significantly different between stayers and leavers for gender p=.12 or year in school p=.46.

Tests of Hypotheses

Hypotheses 1 and 2. A hierarchical regression was conducted to test Hypotheses 1a, 1b and 2. In Step 1, the predictors were FRA, GEN, YER and RES. In Step 2, FDN (mean centered) was added. In Step 3, FIN (mean centered) was added. In Step 4, the FIN x GEN, FDN x GEN and FIN x FDN interaction terms were added. GEN was dummy coded with female as the reference group, female=0, male=1. YER was dummy coded with advanced students as the reference group, advanced students=0, freshman=1. RES was dummy coded with hall 11 as the reference group because hall 11 scored the highest on FHA, residence hall 11=0. Because there were 11 residence halls, 10 dummy codes were created (1-10). Therefore, GEN, YER, and RES were all dummy coded. FHA was the dependent variable.

Hypothesis 1a stated that FIN would be a significant predictor of FHA above FDN as well as the covariates in a cross-sectional hierarchical regression analysis (see Table 8). Hypothesis 1b predicted that the interaction term between FIN and FDN would not be a significant predictor of FHA. Hypothesis 2 stated that the relationship between the perceived norms (FDN and FIN) and FHA would be significantly stronger for women than men. This was tested by assessing the GEN x FIN and GEN x FDN interactions.

Table 8 provides the results of the cross-sectional hierarchical regression. R^2 for Step 1 was significant (R^2=.562; F=62.20; p<.001). FRA (b=.623; β= .681; SE=.025; p<.001) was demonstrated to be a significant predictor of FHA. A one unit change of FRA was associated with a .623 unit change in FHA. GEN (b=.219; β= .116; SE=.051; p<.001) also demonstrated to be a significant predictor of FHA. Because female was coded a 0 and male as 1, a one unit change in GEN (female to male) was associated with a .219 unit increase in FHA. YER did not demonstrate to be a significant predictor of FHA (b=.083; β= .037; SE=.063; p=.185). Eight of the 10 dummy codes for residence hall were significant predictors of FHA, all with negative *beta* values. As stated previously, hall 11 scored the highest on FHA, which served as the reference group and was coded as 0. As a result, a one unit increase for RES (residence hall 11 to another residence hall) was associated with a significant reduction in FHA. Eight of the 10 halls were demonstrated to be significantly lower on FHA than hall 11 (lowest b= -.212; highest b= -.555).

R^2 for Step 2 was also demonstrated to be significant (R^2=.575; F=60.74; p<.001). FDN was a significant predictor (b=.111; β= .121; SE=.026; p<.001) of FHA. A one unit increase in FDN was associated with a .111 unit increase in FHA. R^2 for Step 3 was also demonstrated to be significant (R^2=.578; F=57.22; p<.001). FIN (b=.066; β=.072; SE=.033; p=.047) was demonstrated to be a significant predictor of FHA. A one unit increase in FIN was associated with a .066 unit increase in FHA. Lastly, R^2 for Step 4 was demonstrated to be significant (R^2=.592; F=50.20; p<.001). However, the interaction between FIN and GEN was not demonstrated to be significant (b=.113; β= .078; SE=.066; p=.086) in predicting FHA, although the interaction between the FDN and GEN was demonstrated to be significant (b=.137; β= .091; SE=.067; p=.039). This interaction demonstrates that the effect of FDN in the prediction of FHA was significantly larger for males than females. More specifically, for females only, a one unit

change in FDN was associated with a .219 unit change in FHA. For males only, a one unit change in FDN was associated with a .356 unit change in FHA (see Figure 5). Lastly, as predicted in Hypothesis 1b, the interaction between FIN and FDN was not a significant predictor of FHA (b=-.032; β= -.037; SE=.023; p=.167).

It was concluded that Hypothesis 1a was supported because FIN did explain significant variance beyond FDN in predicting FHA in step three. Hypothesis 1b was supported because the FIN x FDN interaction was not a significant predictor of FHA. The inclusion of FIN explains additional variance beyond FDN in the prediction of FHA, but does not interact with FDN. Lastly, hypothesis 2 was not supported because the significant FDN x GEN interaction was in the opposite direction of the hypothesis (i.e., the relationship between descriptive norms and heavy alcohol use was stronger for men than women).

Table 8
Cross sectional hierarchical regression predicting FHA.

	Step 1				Step 2				Step 3				Step 4			
Model	*b*	*SE*	*β*	*p*	*B*	*SE*	*β*	*p*	*b*	*SE*	*β*	*P*	*b*	*SE*	*β*	*p*
Step 1																
FRA	**.623**	**.025**	**.681**	**<.001**	.591	.026	.646	<.001	.585	.026	.640	<.001	.579	.026	.632	<.001
GEN (Dummy)	**.219**	**.051**	**.116**	**<.001**	.208	.050	.110	<.001	.196	.050	.104	<.001	.185	.050	.098	<.001
YER (Dummy)	.083	.063	.037	.185	.065	.062	.029	.294	.056	.062	.025	.366	.052	.062	.023	.401
Hall 1 (Dummy)	**-.555**	**.116**	**-.185**	**<.001**	-.542	.115	-.181	<.001	-.529	.115	-.177	<.001	-.504	.114	-.168	<.001
Hall 2 (Dummy)	**-.331**	**.120**	**-.101**	**.006**	-.305	.119	-.093	.010	-.296	.118	-.091	-.013	-.305	.117	-.093	.009
Hall 3 (Dummy)	**-.324**	**.123**	**-.095**	**.009**	-.328	.121	-.096	.007	-.322	.121	-.095	.008	-.277	.120	-.081	.021
Hall 4 (Dummy)	**-.212**	**.105**	**-.087**	**.044**	-.229	.104	-.094	.027	-.216	.104	-.089	.037	-.197	.103	-.081	.055
Hall 5 (Dummy)	-.106	.128	-.030	.408	-.145	.126	-.041	.251	-.154	.126	-.043	.224	-.112	.125	-.032	.371
Hall 6 (Dummy)	**-.415**	**.124**	**-.121**	**.001**	-.419	.122	-.122	.001	-.407	.122	-.119	.001	-.388	.121	-.113	.001
Hall 7 (Dummy)	**-.434**	**.127**	**-.121**	**.001**	-.442	.125	-.124	<.001	-.433	.125	-.121	.001	-.396	.123	-.111	.001
Hall 8 (Dummy)	**-.338**	**.122**	**-.102**	**.006**	-.335	.120	-.101	.006	-.332	.120	-.100	.006	-.297	.119	-.090	.013
Hall 9 (Dummy)	-.154	.122	-.046	.207	-.183	.121	-.054	.129	-.178	.120	-.053	.140	-.175	.119	-.052	.142
Hall 10 (Dummy)	**-.266**	**.121**	**-.082**	**.028**	-.254	.119	-.079	.033	-.252	.119	-.078	.035	-.229	.118	-.071	.053
Step 2																
FDN					**.111**	**.026**	**.121**	**<.001**	.070	.033	.076	.035	.023	.042	.025	.582

	Step 1				Step 2				Step 3				Step 4			
Model	*b*	*SE*	*β*	*p*	*B*	*SE*	*β*	*p*	*b*	*SE*	*β*	*P*	*b*	*SE*	*β*	*p*
Step 3																
FIN									**.066**	**.033**	**.072**	**.047**	.022	.044	.023	.622
Step 4																
FIN X GEN													.113	.066	.078	.086
FDN X GEN													**.137**	**.067**	**.091**	**.039**
FIN X FDN													-.032	.023	-.037	.167
R^2	.562				.575				.578				.592			
Change R^2					.013				.003				.014			
Sig.	<.001				<.001				.047				<.001			

Note. GEN Dummy = (Female = 0; Male =1). YER Dummy = (Advanced students = 0; First-year students = 1).

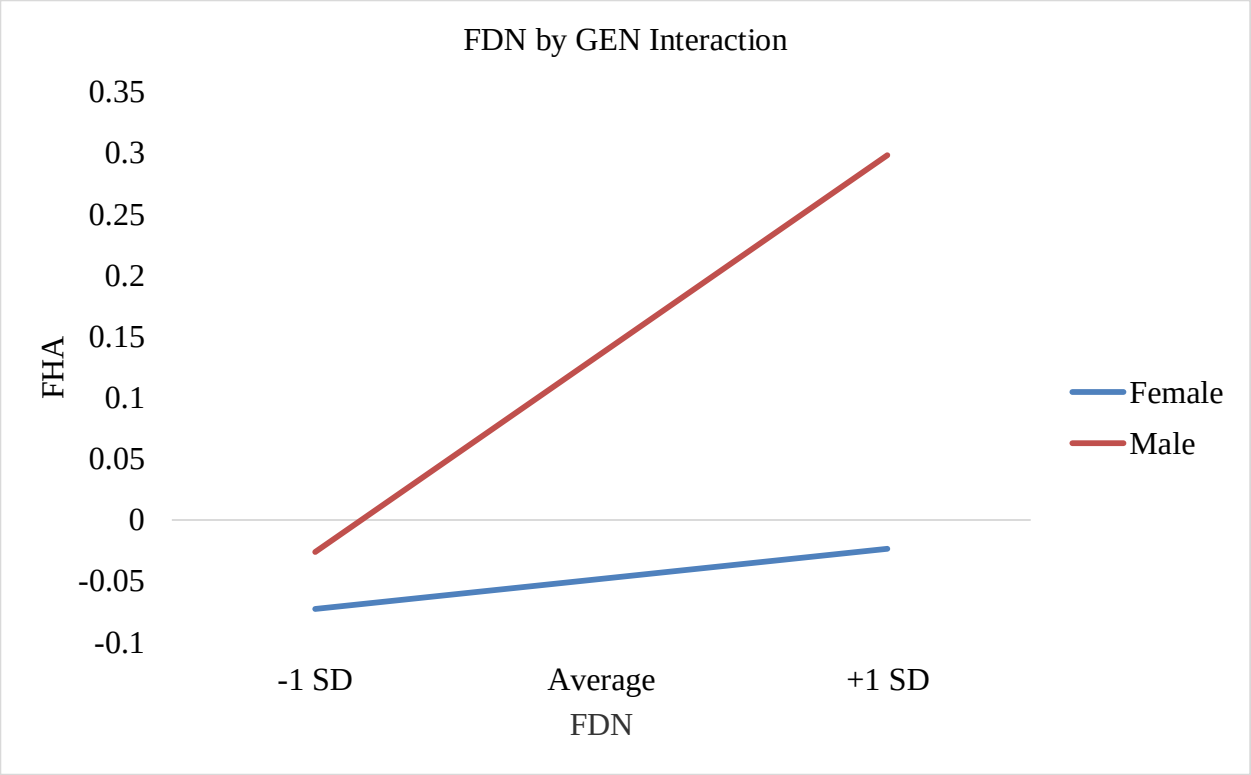

Figure 5. The relationship between FDN and FHA across GEN using Simple Slopes.

A hierarchical regression was conducted to test Hypotheses 1c, 1d and 2. Hypotheses 1c and Hypothesis 1d were similar to Hypothesis 1a and Hypothesis 1b. The main difference was that the regression was longitudinal instead of cross sectional. In Step 1, the predictors were FHA, GEN, YER, and RES. In Step 2, FDN (mean centered) was added. In Step 3, FIN (mean centered) was added. In step four the FIN x GEN, FDN x GEN, and FIN x FDN interaction terms were added. GEN was dummy coded with female as the reference group, female=0, male=1. YER was dummy coded with advanced students as the reference group, advanced students=0, first-year students=1. RES was dummy coded with hall 11 as the reference group because hall 11 scored the highest on FHA, residence hall 11=0. Because there were 11 residence

halls, 10 dummy codes were created (1-10). Therefore, GEN, YER, and RES were all dummy coded. SHA was the dependent variable.

Hypothesis 1b stated that FIN would be a significant predictor of SHA above FDN as well as the covariates (see Table 9). Hypothesis 1d predicted that the FIN X FDN interaction would not be a significant predictor of SHA. Hypothesis 2 stated that the relationship between the perceived norms (FDN and FIN) and SHA would be significantly stronger for women than men which was once again tested with the GEN x FIN and GEN x FDN interactions.

Table 9 provides the results of the longitudinal hierarchical regression. R^2 for Step 1 was significant (R^2=.593; F=32.62; p<.001). FHA (b=.686; β= .744; SE=.038; p<.001) was a significant predictor of SHA. A one unit increase in FHA was associated with a .686 unit increase in SHA. GEN (b=.016; β=.008; SE=.072; p=.83) and YER (b=.141; β= .063; SE=.090; p=.12) were not demonstrated to be significant predictors of SHA. None of the dummy codes for RES were demonstrated to be significant predictors of SHA. That is, after accounting for fall heavy alcohol use, zero of the ten halls were significantly different on SHA than the reference group (hall 11).

R^2 in Step 2 was not significant (R^2=.596; F=30.57; p=.139). FDN (b=.057; β=.060; SE=.060; p=.139) was not demonstrated to be a significant predictor of SHA. R^2 in Step 3 was not significant (R^2=.597; F=28.55; p=.393). FIN (b=.043; β=.048; SE=.051; p=.393) was not demonstrated to be a significant predictor of SHA. Lastly, R^2 in Step 4 was not significant (R^2=.600; F=23.86; p=.525). The interactions between FIN and GEN (b=-.057 β=-.038; SE=.103; p=.577), FDN and GEN (b=.053; β=.032; SE=.109; p=.625) and FIN and FDN (b=.050; β=.053; SE=.109; p=.170) were not demonstrated to be significant predictors of SHA.

It was concluded that Hypothesis 1c was not supported because FIN did not explain significant variance beyond FDN in the prediction of SHA in Step 3. Consistent with hypothesis 1d, the interaction term between FIN and FDN was not a significant predictor of SHA in Step 4. Hypothesis 2 was not supported. However, given that no effects in Steps 2, 3 or 4 were significant, this null result should be viewed with caution. The interaction term between FDN and GEN and the interaction term between FIN and GEN were both not significant in Step 4. The only significant predictor of SHA was FHA in Step 1.

Table 9

Longitudinal hierarchical regression predicting SHA

	Step 1				Step 2				Step 3				Step 4			
Model	*b*	*SE*	*B*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*
Step 1																
FHA	**.686**	**.038**	**.744**	**<.001**	.672	.039	.729	<.001	.665	.040	.721	<.001	.668	.040	.724	<.001
GEN (Dummy)	.016	.072	.008	.830	.012	.072	.006	.867	.009	.072	.005	.899	.015	.073	.008	.834
YER (Dummy)	.141	.090	.063	.120	.137	.090	.061	.129	.134	.090	.060	.138	.138	.091	.062	.131
Hall 1 (Dummy)	.082	.169	.030	.627	.087	.169	.032	.606	.096	.169	.035	.571	.088	.171	.032	.607
Hall 2 (Dummy)	.169	.175	.053	.334	.185	.175	.058	.291	.191	.175	.060	.276	.190	.177	.060	.282
Hall 3 (Dummy)	-.090	.180	-.027	.618	-.094	.180	-.028	.602	-.089	.180	-.026	.623	-.103	.182	-.031	.571
Hall 4 (Dummy)	.082	.154	.036	.594	.071	.154	.031	.645	.082	.154	.036	.596	.069	.157	.030	.661
Hall 5 (Dummy)	-.071	.202	-.018	.724	-.101	.203	-.026	.619	-.101	.203	-.026	.618	-.105	.203	-.027	.605
Hall 6 (Dummy)	-.129	.193	-.035	.505	-.120	.193	-.032	.533	-.114	.193	-.031	.555	-.110	.196	-.029	.575
Hall 7 (Dummy)	.109	.187	.031	.561	.099	.187	.028	.597	.099	.187	.028	.598	.087	.189	.024	.646
Hall 8 (Dummy)	-.024	.174	.008	.890	-.020	.173	-.007	.907	-.013	.174	-.004	.943	-.016	.174	-.005	.927
Hall 9 (Dummy)	.151	.173	.048	.382	.124	.173	.040	.475	.132	.174	.042	.447	.133	.175	.042	.450
Hall 10 (Dummy)	.072	.185	.021	.698	.068	.184	.019	.713	.075	.185	.021	.686	.057	.186	.016	.758
Step 2																
FDN					.057	.039	.060	.139	.027	.052	.028	.606	.011	.066	.012	.867

Model	Step 1				Step 2				Step 3				Step 4			
	b	*SE*	*B*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*
Step 3																
FIN									.043	.051	.048	.393	.065	.065	.071	.318
Step 4																
FIN X GEN													-.057	.103	-.038	.577
FDN X GEN													.053	.109	.032	.625
FIN X FDN													.050	.036	.053	.170
R^2	.593				.596					.597			.600			
Change R^2					.003					.001			.003			
Sig.	<.00 1				.139					.393			.525			

Note. GEN Dummy = (Female = 0; Male = 1). YER Dummy = (Advanced students = 0; First-year students = 1).

A hierarchical regression was conducted to test Hypotheses 1e, 1f and 2. Hypotheses 1e and Hypothesis 1f were similar to Hypothesis 1c and Hypothesis 1d. The main difference was that the dependent variable was SCN instead of SHA. In Step 1, the predictors were FHA, GEN, YER, and RES. In Step 2, FDN (mean centered) was added. In Step 3, FIN (mean centered) was added. In Step 4, the FIN x GEN, FDN x GEN and FIN x FDN interaction terms were added. GEN was dummy coded with female as the reference group, female=0, male=1. YER was dummy coded with advanced students as the reference group, advanced students=0, first-year students=1. RES was dummy coded with hall 11 as the reference group because hall 11 scored the highest on FHA, residence hall 11=0. Because there were 11 residence halls, 10 dummy codes were created (1-10). Therefore, GEN, YER, and RES were all dummy coded. SCN was the dependent variable.

Table 10 gives the results of this longitudinal hierarchical regression. R^2 for Step 1 was significant (R^2=.405; F=13.20; p<.001). FHA (b=.881; β= .625; SE=.076; p<.001) was demonstrated to be a significant predictor of SCN. A one unit increase in FHA was associated with a .881 unit increase in SCN. GEN (b=-.168; β=-.056; SE=.151; p=.267) and YER (b=.000; β=.000; SE=.188; p=.999) were not demonstrated to be significant predictors of SCN. Two of the ten dummy codes for RES were significant predictors of SCN. The positive b values indicate that SCN was significantly higher than in the reference group (hall 11) in two of the ten halls (lowest b=.797; highest b=1.199).

R^2 for Step 2 was not significant (R^2=.407; F=12.29; p=.433). FDN (b=.062; β=.041; SE=.079; p=.433) was not demonstrated to be a significant predictor of SCN. R^2 for Step 3, was not significant (R^2=.407; F=11.42; p=.911). FIN (b=-.012; β=-.008; SE=.107; p=.911) was not demonstrated to be a significant predictor of SCN. Lastly, R^2 for Step 4 was not significant

(R^2=.408; F=9.46; p=.908). The interaction between FIN and GEN (b=.095; β=.039; SE=.216; p=.660), FDN and GEN (b=.011; β=.004; SE=.225; p=.960), and FIN and FDN (b=.018; β=.012; SE=.076; p=.809) were not demonstrated to be significant predictors of SCN.

It was concluded that Hypothesis 1e was not supported because FIN did not explain significant variance beyond FDN in predicting SCN in Step 3. Consistent with Hypothesis 1f, the interaction term between FIN and FDN was not a significant predictor of SCN in Step 4. However, as was the case with the other longitudinal analysis, none of the effects in steps 2, 3 and 4 were significant. Hypothesis 2 was also not supported. The interaction term between FDN and GEN and the interaction term between FIN and GEN in the prediction of SCN were both not significant in Step 4.

Table 10
Longitudinal hierarchical regression predicting SCN

	Step 1				Step 2				Step 3				Step 4			
Model	*b*	*SE*	*β*	*p*	*b*	*SE*	*B*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*
Step 1																
FHA	**.881**	**.076**	**.625**	**<.001**	.866	.079	.615	<.001	.868	.081	.616	<.001	.861	.083	.611	<.001
GEN (Dummy)	-.168	.151	-.056	.267	-.173	.151	-.058	.254	-.171	.152	-.057	.261	-.109	.153	-.057	.269
YER (Dummy)	.000	.188	.000	.999	-.004	.188	-.001	.982	-.005	.188	-.001	.979	-.008	.190	-.002	.966
Hall 1 (Dummy)	**.797**	**.352**	**.178**	**.025**	.799	.353	.178	.024	.798	.353	.178	.025	.801	.357	.179	.026
Hall 2 (Dummy)	.627	.354	.127	.078	.644	.355	.130	.071	.644	.356	.130	.072	.641	.359	.129	.076
Hall 3 (Dummy)	.417	.376	.076	.270	.402	.377	.073	.287	.401	.378	.073	.289	.418	.382	.076	.275
Hall 4 (Dummy)	.534	.311	.150	.087	.520	.311	.147	.096	.518	.313	.146	.099	.528	.317	.149	.07
Hall 5 (Dummy)	.151	.406	.025	.711	.121	.408	.020	.768	.120	.409	.020	.769	.124	.411	.021	.764
Hall 6 (Dummy)	.383	.392	.066	.329	.392	.392	.068	.319	.393	.393	.068	.318	.394	.399	.068	.324
Hall 7 (Dummy)	.625	.380	.113	.101	.609	.381	.111	.111	.609	.381	.111	.111	.647	.388	.117	.096
Hall 8 (Dummy)	.643	.360	.132	.075	.641	.360	.132	.076	.640	.361	.132	.077	.641	.363	.132	.79
Hall 9 (Dummy)	**1.199**	**.349**	**.247**	**.001**	1.172	.351	.241	.001	1.170	.352	.241	.001	1.170	.357	.241	.001
Hall 10 (Dummy)	.532	.375	.099	.157	.521	.376	.097	.166	.519	.377	.097	.170	.514	.380	.096	.177
Step 2																
FDN					.062	.079	.041	.433	.071	.109	.047	.517	.073	.139	.048	.601

Model	Step 1				Step 2				Step 3				Step 4			
	b	*SE*	*β*	*p*	*b*	*SE*	*B*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*
Step 3																
FIN									-.012	.107	-.008	.911	-.047	.135	-.032	
Step 4																
FIN X GEN													.095	.216	.039	
FDN X GEN													.011	.225	.004	
FIN X FDN													.018	.076	.012	
R^2	.405				.407					.407			.408			
Change R^2					.001					.000			.001			
Sig.	<.001				.433					.911			.908			

Note. GEN Dummy = (Female = 0; Male = 1). YER Dummy = (Advanced students = 0; First-year students = 1).

Hypothesis 3. Hypothesis 3 stated that FDN is a better predictor than FIN for FHA. However, FIN is a better predictor than FDN for SHA. The Williams formula was used to calculate a significant difference between two dependent correlations (Steiger, 1980). The Williams formula measures which one of two variables is more strongly correlated with an outcome. As a result, the Williams formula is an appropriate statistic to test Hypothesis 3. A significant difference between two dependent correlations is dependent upon the distance between the two correlations and sample size. A larger distance between the two correlations and a larger sample size increases the likelihood of a significant difference between two dependent correlations (see Figure 6). One limitation to the Williams Formula is restriction of range. Consequently the mean, standard deviation and coefficient of variation are provided for each variable in Table 11.

$$T_2 = (r_{jk} - r_{jh}) \sqrt{\frac{(N-1)(1+r_{kh})}{2\left(\frac{N-1}{N-3}\right)|\mathbf{R}| + \bar{r}^2(1-r_{kh})^3}}, \quad (7)$$

$$|\mathbf{R}| = (1 - r_{jk}^2 - r_{jh}^2 - r_{kh}^2) + (2r_{jk}r_{jh}r_{kh})$$

Figure 6. Williams Formula.

When predicting FHA, the correlation between FIN and FHA was r =.365, p<.001 and the correlation between FDN and FHA was r =.343, p<.001. Lastly, the correlation between FIN and FDN was r =.675, p<.001. The two dependent correlations were not significantly different from one another and Hypothesis 3 was not supported, p=.47. In reference to Table 11, the

standard deviations and coefficients of variation were similar across FIN and FDN. As a result, there is little concern of the restriction of range limitation for this analysis.

For predicting SHA, the correlation between FIN and SHA was r =.270, p<.001 and the correlation between the FDN and SHA was r =.342, p<.001. Lastly, the correlation between FIN and FDN was r =.675, p<.001. The two dependent correlations were not significantly different from one another and Hypothesis 3 was not supported, p=.10. To further elaborate on a conceptual understanding of the Williams formula, the distance between the two correlations is larger in this analysis (.072) than the previous analysis (.022). As a result, the p-value in this example is lower, but did not reach the threshold for significance.

Table 11
Mean, standard deviation and coefficient of variation

Variable	Mean	Standard Deviation	Coefficient of Variation
FDF	2.94	.88	29.93
FDS	2.97	.99	33.33
FDI	2.64	1.32	50.00
FDO	2.60	.90	34.62
FIN	2.78	1.15	41.37
FDN	2.72	1.03	37.87
FDW	3.09	1.15	37.22
FDC	3.46	1.13	32.66
FAC	2.88	.96	33.33
FAT	3.15	.71	22.54
SAI	2.84	.77	27.11
SDS	2.79	.85	30.47

Hypothesis 4. Hypothesis 4 stated that the relationship between perceived norms and alcohol use was stronger for more proximal than distal groups, except for first year students versus seniors in the spring. All hypotheses were tested with the Williams Formula (Steiger, 1980). The Williams Formula is an appropriate statistic for Hypothesis 4 because it compares the difference between two dependent correlations. The Williams formula measures which one of

two variables is more strongly correlated with an outcome. A limitation to the Williams formula is restriction of range. As a result, Table 11 provides the mean, standard deviation and coefficient of variation for the variables in the analysis.

Analysis 4a. Hypothesis 4a predicted that FHA would be more strongly correlated with FDN than FDC. Results showed that the correlation between FDN and FHA was r =.343, p<.001 compared to r =.197, p<.001 for FDC and FHA. Lastly, the correlation between the FDN and FDC was r =.622, p<.001. The two dependent correlations were significantly different from one another (t=4.287, p<.001) and supported Hypothesis 4a. The standard deviation of FDC was larger than FDN. As a result, restriction of range was not a concern in this analysis.

Analysis 4b. Hypothesis 4b predicted that FHA would be more strongly correlated with FDN than FDW. Results showed that the correlation between FDN and FHA was r =.343, p<.001 compared to r =.255, p<.001 for FDW and FHA. Lastly, the correlation between FDN and FDW was r =.656, p<.001. The two dependent correlations were significantly different from one another (t=2.428, p=.02) and supported Hypothesis 4b. The standard deviation of FDW was larger than FDN. As a result, restriction of range was not a concern in this analysis.

Analysis 4c. Hypothesis 4c predicted that FHA would be more strongly correlated with FDI than FDO. Results showed that the correlation between FDI and FHA was r =.458, p<.001 compared to r =.214, p<.001 for FDO and FHA. Lastly, the correlation between FDI and FDO was r =.488, p<.001. The two dependent correlations were significantly different from one another (t=6.25, p<.001) and supported Hypothesis 4c. The standard deviation and coefficient of variation were noticeably larger in FDI than FDO. As a result, restriction of range is a concern in this analysis.

Analysis 4d. Hypothesis 4d predicted that FHA would be more strongly correlated with FAC than FAT. Results showed that the correlation between FAC and FHA was r =.381, p<.001 compared to r =.002, p=.98 for FAT and FHA. Lastly, the correlation between FAC and FAT was r =.274, p<.001. The two dependent correlations were significantly different from one another (t=9.078, p<.001) and supported Hypothesis 4d. The standard deviation and coefficient of variation were noticeably larger in FAC than FAT. As a result, restriction of range is a concern in this analysis.

Analysis 4e. Hypothesis 4e predicted that, for first-year students only in the fall, FHA would be more strongly correlated with FDF than the FDS. Results showed that the correlation between FDF and FHA was r =.209, p<.001 compared to r =.163, p<.001 for FDS and FHA. Lastly, the correlation between FDF and FDS was r =.306, p<.001. The two dependent correlations were not significantly different from one another (t=0.86, p=.39).

Analysis 4f. Hypothesis 4f predicted that, for first-year student only in the spring, SHA would be more strongly correlated with SDS than SDF. Results showed that, the correlation between SDF and SHA was r =.292, p<.001 compared to r =.331, p<.001 for SDS and SHA. Lastly, the correlation between SDF and SDS was r =.460, p<.001. The two dependent correlations were not significantly different from one another (t=0.86, p=.39).

To summarize perceived norms of proximal groups were more predictive of heavy alcohol use than perceived norms of distal groups. Perceived norms of CSU students, own residence hall and attitudes of friends regarding alcohol use was more predictive than perceived norms of CU students, University of Wyoming students, other residence halls and attitude of the typical student, respectively. There was no difference in perceived norms between first-year students and seniors of alcohol use in predicting heavy alcohol use.

Hypothesis 5. Hypothesis 5 stated that perceived norms and alcohol use are highest in fall semester of college in comparison to retrospective high school and spring semester of college. This hypothesis was tested with three separate analyses. The first analysis was a cross-sectional repeated measures MANOVA comparing retrospective high school alcohol use and retrospective perceived norms to fall college alcohol use and fall perceived norms. The second analysis was a longitudinal repeated measures MANOVA comparing fall alcohol use, fall perceived norms and fall future intentions to spring alcohol use, spring perceived norms and spring future intentions. The third analysis was a repeated measures mixed model ANOVA. Quantity of alcohol per event was compared from fall (FQU) to spring (SQU) for two different groups of participants. FRA was used to categorize participants as drinkers or non-drinkers in high school, which served as the independent variable. It was hypothesized that quantity per event would decrease from fall (FQU) to spring (SQU) only for those who reported being a non-drinker in high school.

Analysis 5a. Hypothesis 5a stated that retrospective high school alcohol use (FRA) would be significantly lower than alcohol use in college (FFA), the retrospective perceived injunctive norm regarding high school students (FRN) would be significantly lower than the perceived injunctive norm regarding CSU students (FIN) and the retrospective perceived descriptive norm regarding high school students (FRD) would be significantly lower than the perceived descriptive norm regarding CSU students (FDN).

The overall MANOVA was significant $F(3,521)=23.10$, $p<.001$. Contrary to what was predicted, FRA ($M=2.01$; $SD=1.18$) was significantly higher than FFA ($M=1.79$; $SD=1.07$), $F(1,523)=29.53$, $p<.001$, $d=.20$. Again, opposite to the prediction, FRD ($M=2.95$; $SD=1.20$) was significantly higher than FDN ($M=2.76$; $SD=1.04$), $F(1,523)=48.02$, $p<.001$, $d=.17$. Lastly,

opposite of what was predicted, FRN (*M*=3.10; *SD*=1.22) was significantly higher than FIN (*M*=2.85; *SD*=1.13), *F*(1,523)=2.58, *p*<.001, *d*=.21 (see Table 12). Thus, in this sample retrospective accounts of high school alcohol use and perceived norms of alcohol use were indicated to be higher than alcohol use and perceived norms in the first semester of college. It is suggested that retrospective accounts of high school alcohol use and perceived norms may have been overestimated. When estimating retrospective high school alcohol use and perceived norms students may have been anchoring based on current alcohol use and perceived norms in the first semester of college.

Table 12
Alcohol use and perceived norms means over time

	Retrospective High School	Fall 2008
Alcohol Frequency (FRA & FFA)	2.01	1.79*
Injunctive Norm (FRN & FIN)	3.10	2.85*
Descriptive Norm (FRD & FDN)	2.95	2.76*

Note: all *p<.05

Analysis 5b. Hypothesis 5b predicted that among a sample of first-year students, quantity per event (FQU vs. SQU), frequency of binge drinking (FFQ vs. SFQ), frequency of being drunk (FDK vs. SDK), future alcohol use intentions (FAI vs. SAI), the perceived injunctive norm regarding CSU students (FIN vs. SIN) and perceived descriptive norm regarding CSU students (FDN vs. SDN) would all significantly decrease from fall to spring.

The overall MANOVA was significant $F(6,164)=4.54$, $p<.001$, partial eta-squared = .14. Consistent with the hypothesis, FQU was significantly higher (M=2.62; SD=1.35) than SQU (M=2.24; SD=1.16), $F(1,169)=8.23$, $p<.01$, d=.30. Inconsistent with the hypothesis, FFQ (M=1.96; SD=1.15) was significantly lower than SFQ (M=2.15; SD=1.13), $F(1,169)=5.93$, p=.016, d=.17. FDK was not significantly different (M=2.04; SD=1.11) than SDK (M=2.12; SD=1.10), $F(1,169)=1.05$, p=.31, d=.07. Inconsistent with the hypothesis, FDN (M=2.68; SD=1.01) was significantly lower SDN (M=2.85; SD=1.08), $F(1,169)=4.64$, p=.03, d=.16. FIN (M=2.83; SD=1.18) was not significantly different from SIN (M=2.92; SD=1.10), $F(1,169)=1.30$, p=.26, d=.08. Lastly, FAI (M=2.07; SD=.44) was not significantly different from SAI (M=1.97; SD=.54), $F(1,169)=3.86$, p=.051, d=.20 (see Table 13). Thus, out of the six variables, two variables had a significant increase (alcohol frequency and perceived descriptive norm) and one variable had a significant decrease (alcohol quantity per event). From fall to spring, first-year students are drinking more often, but less drinks per event.

Table 13
Alcohol use variables for first year students from fall to spring

	Fall 2008	Spring 2009
Alcohol Quantity (FQU vs. SQU)	2.62	2.24*
Alcohol Frequency (FFQ vs. SFQ)	1.96	2.15*
Alcohol Drunk (FDK vs. SDK)	2.04	2.12
Descriptive Norm (FDN vs. SDN)	2.68	2.85*
Injunctive Norm (FIN vs. SIN)	2.83	2.92
Future Intentions (FAI vs. SAI)	2.07	1.97

Note: all *p<.05

Analysis 5c. A repeated measures mixed model ANOVA was conducted for first-year students only. FQU was compared to SQU among those who reported drinking in high school and those who did not. Participants were split into two groups based on responses to FRA. This measure asked how many times the participant used alcohol in a typical month in high school. The answer of "none" accounted for 50% of the responses and was classified as a non-drinker (n=132). All other answers were classified as a drinker (n=133). Non-drinker versus drinker served as the independent variable. Results showed that the difference in FQU to SQU produced a significant interaction with FRA, $F(1,263)=261.24$, $p<.001$, partial eta-squared=.50 (see Table 14). Non-drinkers in high school had a significantly larger difference in FQU (M=4.18; SD=1.50) and SQU (M=.80; SD=1.03) than the drinkers in high school, FQU (M=2.50; SD=1.13) and SQU (M=2.57; SD=1.04; see Figure 7). The data are consistent with the idea that for drinkers in high school their alcohol quantity per event remains stable from fall (FQU) to spring (SQU). For non-drinkers in high school their alcohol quantity per event decreases from fall (FQU) to spring (SQU). The effect size of .50 for the interaction exceeded Cohen's threshold of .14 for a large effect (Cohen, 1988)

Table 14
First year students alcohol quantity from fall to spring for drinkers and non-drinkers

	Fall 2008			Spring 2009		
	Drinker	Non-Drinker	Total	Drinker	Non-Drinker	Total
Alcohol Quantity (FQU vs. SQU)	2.50	4.18	3.34	2.57	.80	1.69

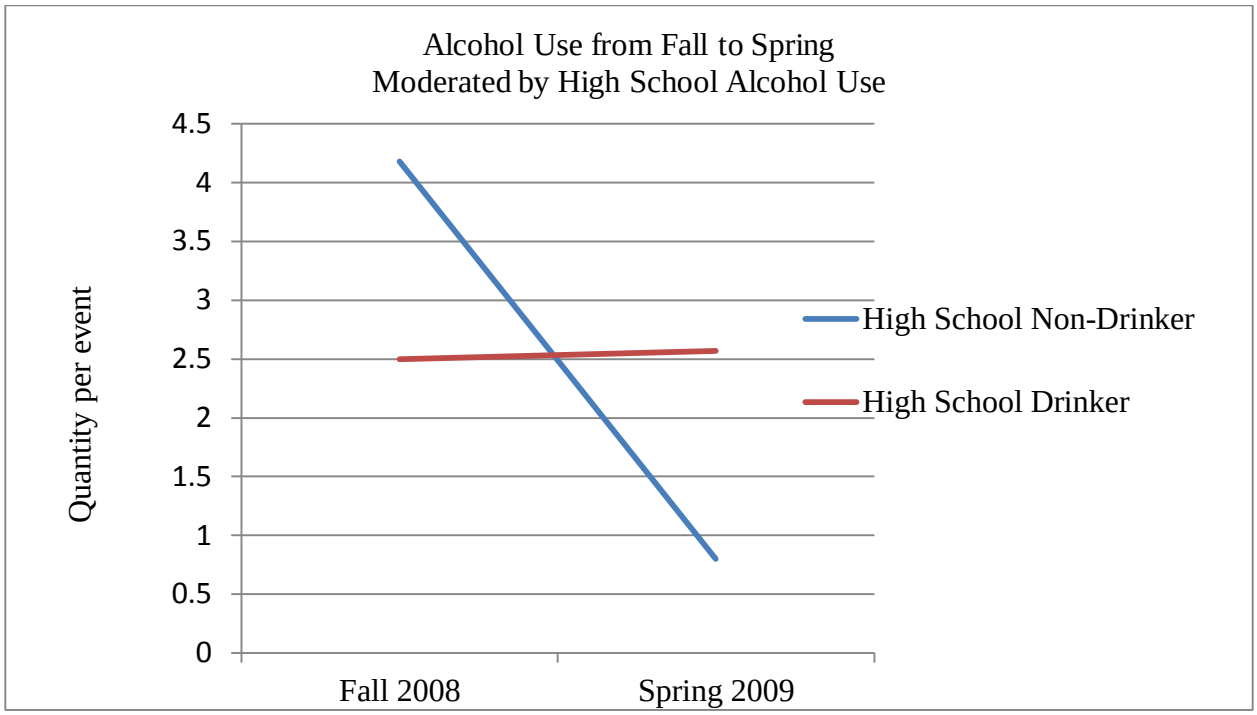

Figure 7. Alcohol use from fall to spring for high school non-drinkers and drinkers

Hypothesis 6. Hypothesis 6 stated that the relationship between perceived norms and alcohol use would be stronger in college than in high school. This hypothesis was tested once for the perceived descriptive norm and a second time for the perceived injunctive norm. This hypothesis was tested by calculating a significant difference between two independent correlations, which is a Fisher r to z transformation. Because the difference between two independent correlations are being tested, a Fisher r to z transformation is appropriate. The Williams formula is appropriate for testing the difference between two dependent correlations. The means for perceived norms for retrospective high school and fall are provide in Table 15.

Table 15
Perceived norms in retrospective high school and fall college

	Retro-High School	Fall 2008
Descriptive Norm (FQU vs. SQU)	2.94	2.72
Injunctive Norm (FFQ vs. SFQ)	3.09	2.78

Analysis 6a. Hypothesis 6a stated that the relationship between the perceived descriptive norm and alcohol use would be higher in college than retrospective high school. Results showed that the correlation between FRD (*M*=2.94; *SD*=1.20; *CV*=40.82) and FRA (*M*=1.88; *SD*=1.12; *CV*=59.57) was r =.305, p<.001. The correlation between FDN (*M*=2.72; *SD*=1.03; *CV*=37.87) and FHA was r =.341, p<.001. The two independent correlations were not significantly different from one another (t=.64; p=.31).

Analysis 6b. Hypothesis 6b stated that the relationship between the perceived injunctive norm and alcohol use would be higher in college than high school. Results showed that the correlation between FRN (*M*=3.09; *SD*=1.23; *CV*=39.81) and FRA (*M*=1.88; *SD*=1.12; *CV*=59.57) was r =.352, p<.001. The correlation between FIN (*M*=2.78; *SD*=1.15; *CV*=41.37) and FHA was r =.365, p<.001. The two independent correlations were not significantly different from one another (t=.24; p=.41). Consequently, the relationship between perceived norms and heavy alcohol use was not stronger in college than high school.

Hypothesis 7. Hypothesis 7 predicted that FHA, FCN, GEN, YER, RES, personal attitude toward alcohol use (FAP), and parental approval of getting drunk from (FPD), would add significant variance beyond FDN in the prediction of SIN.

Analysis 7. Hypothesis 7 was tested with the following hierarchical regression. The dependent variable was SIN. In Step 1, FDN was added. In Step 2, FHA, FCN, GEN, YER, RES, FAP and FPD were added. In Step 3, the FHA x GEN interaction term was added.

Table 16 provides the results of the longitudinal hierarchical regression. R^2 for Step 1, was significant (R^2=.291; F=118.287; p<.001). FDN (b=.614; β= .540; SE=.056; p<.001) was demonstrated to be a significant predictor of SIN. A one unit increase in FDN was associated with a .614 unit increase of SIN. R^2 for Step 2, was significant (R^2=.359; F=8.979; p=.029). FHA (b=.165; β= .151; SE=.079; p<.038) was demonstrated to be a significant predictor of SIN. A one unit increase in FHA was associated with a .165 unit increase in SIN. However, FCN (b=.009; β= .008; SE=.066; p=.888), GEN (b=.059; β= .026; SE=.114; p=.608), YER (b=.101; β=.269; SE=.143; p=.061), FAP (b=.074; β= .070; SE=.066; p=.264) and FPD (b=.015; β= .014; SE=.061; p=.800) were not demonstrated to be significant predictors of SIN. A total of 1/10 of the RES dummy codes (Hall 5) (b=.983; β=.209; SE=.317; p=.002) was a significant predictor of SIN. A one unit increase from the reference group (hall 11) to hall 5 was associated with a .983 unit increase in SIN. R^2 for Step 3, was not significant (R^2=.360; F=8.46; p=.719). The interaction term between FHA and GEN in the prediction of SIN was not significant (b=-.041; β=-.026; SE=.113; p=.719). Thus, only fall heavy alcohol use provided additional significant explained variance of the perceived injunctive norm above and beyond the perceived descriptive norm. As a result, Hypothesis 7 was not supported.

Table 16
Longitudinal hierarchical regression predicting SIN

	Step 1				Step 2				Step 3			
Model	*B*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*
Step 1												
FDN	**.614**	**.056**	**.540**	**<.001**	.529	.060	.464	<.001	.530	.060	.466	<.001
Step 2												
FHA					**.165**	**.079**	**.151**	**.038**	.187	.101	.171	.064
FCN					.009	.066	.008	.888	.005	.067	.005	.935
GEN (Dummy)					.059	.114	.026	.608	.060	.114	.027	.599
YER (Dummy)					.269	.143	.101	.061	.270	.144	.101	.061
FAP					.074	.066	.070	.264	.073	.066	.069	.268
FPD					.015	.061	.014	.800	.017	.061	.015	.781
Hall 1 (Dummy)					.321	.264	.099	.224	.335	.267	.103	.210
Hall 2 (Dummy)					.365	.272	.097	.181	.382	.277	.101	.168
Hall 3 (Dummy)					.433	.280	.109	.123	.446	.283	.112	.115
Hall 4 (Dummy)					.305	.239	.110	.204	.315	.241	.114	.193
Hall 5 (Dummy)					.983	.317	.209	.002	.985	.318	.209	.002
Hall 6 (Dummy)					.183	.306	.040	.551	.201	.310	.044	.518
Hall 7 (Dummy)					.568	.289	.134	.050	.570	.290	.134	.050
Hall 8 (Dummy)					.472	.267	.136	.078	.485	.270	.139	.073
Hall 9 (Dummy)					.236	.268	.064	.380	.250	.272	.068	.358
Hall 10 (Dummy)					.447	.287	.108	.120	.461	.290	.111	.112
Step 3												
FHA X GEN									-.041	.113	.026	.719
R^2	.677				.701				.703			
Change in R^2	.677				.701				.703			
Sig.	<.001				.001				.060			

Note. GEN Dummy = (Female = 0; Male =1). YER Dummy = (Advanced students = 0; First-year students = 1)

Hypothesis 8. Hypothesis 8 predicted that FHA, FCN, GEN, YER, would explain additional significant variance beyond FIN in the prediction of SDN.

Analysis 8. Table 17 provides the results of the longitudinal hierarchical regression. R^2 for Step 1 was significant (R^2=.232; p<.001). FIN (b=.518; β= .481; SE=.055; p<.001) was demonstrated to be a significant predictor of SDN. A one unit increase in FIN was associated with an increase of .518 units of SDN. R^2 for Step 2 was not significant (R^2=.270; p=.403). FHA (b=.041; β = .045; SE=.073; p=.540), FCN (b=.047; β= .042; SE=.069; p=.501), GEN (b=.155; β =.070; SE=.118; p=.190) and YER (b=.184; β=.147; SE=.069; p=.212), were not significant predictors of SDN. A total of 1/10 of the RES dummy codes was a significant predictor of SDN. Hall 3 (b=.566; β=-.148; SE=.284; p=.048) was a significant predictor of SDN. A one unit increase in RES (Residence hall 11 to 3) was associated with a .566 unit increase in SDN. R^2 for Step 3 was not significant (R^2=.272; p=.460). The interaction term between FHA and GEN in the prediction of the SDN was not significant (b=-.088; β=-.056; SE=.119; p=.460). In this exploratory longitudinal hierarchical regression there was only one dummy coded hall that was a significant predictor of SDN beyond FIN. As a result, Hypothesis 8 was not supported.

Table 17
Longitudinal hierarchical regression predicting SDN

	Step 1				Step 2				Step 3			
Model	*b*	*SE*	*β*	*P*	*b*	*SE*	*β*	*p*	*b*	*SE*	*β*	*p*
Step 1												
FIN	**.518**	**.055**	**.481**	**<.001**	.463	.060	.431	<.001	.469	.061	.436	<.001
Step 2												
FHA					.045	.073	.041	.540	.091	.096	.083	.345
FCN					.047	.069	.042	.501	.038	.070	.034	.584
GEN (Dummy)					.155	.118	.070	.190	.155	.118	.070	.190
YER (Dummy)					.184	.147	.069	.212	.187	.147	.070	.205
Hall 1 (Dummy)					-.049	.271	-.015	.856	-.024	.273	-.007	.931
Hall 2 (Dummy)					.044	.283	.012	.875	.079	.287	.021	.783
Hall 3 (Dummy)					**.566**	**.284**	**.148**	**.048**	.592	.287	.155	.040
Hall 4 (Dummy)					.304	.246	.111	.218	.324	.248	.118	.192
Hall 5 (Dummy)					.446	.331	.092	.178	.443	.331	.091	.182
Hall 6 (Dummy)					.120	.315	.026	.703	.154	.318	.034	.630
Hall 7 (Dummy)					.196	.297	.047	.510	.200	.298	.048	.501
Hall 8 (Dummy)					.244	.278	.069	.381	.269	.280	.076	.337
Hall 9 (Dummy)					.302	.276	.083	.275	.329	.278	.090	.239
Hall 10 (Dummy)					.111	.297	.027	.710	.138	.300	.033	.645
Step 3												
FHA X GEN									-.088	.119	-.056	.460
R^2	.232				.270				.272			
Change in R^2					.039				.001			
Sig.	<.001				.403				.460			

Note. GEN Dummy = (Female =0; Male = 1). YER Dummy = (Advanced students = 0; First-year students = 1)

CHAPTER 7

DISCUSSION

The purpose of the present study was to investigate the relationship between perceived norms of heavy peer alcohol use and self-reported heavy alcohol use among college students from a large public university. As hypothesized (Hypothesis 1a), the perceived injunctive norm did predict additional unique variance in heavy alcohol use above and beyond the effect of the perceived descriptive norm. Social norms marketing campaigns should add an injunctive norm to the main message being advertised. The injunctive norm could be illustrated with text or with images. Smiley faces have been shown to be an influential injunctive norm for recycling (Schultz et al., 2007). Social norms marketing campaigns could add smiles among a group of light drinkers or non-drinkers to accurately illustrate the injunctive norm (most approve of light drinking or no drinking at all).

As predicted in Hypotheses 1b, and 1d, the perceived injunctive norm and perceived descriptive norm did not interact in the prediction of heavy alcohol use. This suggests that the combined effect of the perceived injunctive norm and perceived descriptive norm to predict heavy alcohol use is additive and not multiplicative. This provides a unique contribution to the literature because previous research has argued that the perceived injunctive norm and perceived descriptive norm do interact in predicting college alcohol use, although lacking supporting evidence (Rimal & Real, 2003; Rimal & Real, 2005). More specifically, it has been suggested that the relationship between the perceived descriptive norm and behavior is stronger when the injunctive norm is high. However, this is not consistent with the FTNC which states that behavior is best predicted when both norms are in agreement. For example, previous research has shown that there is a positive relationship between the perceived descriptive norm and college

alcohol use. As a result, if the perceived descriptive norm is low, alcohol use will also be low. This relationship would be not be strengthened with the addition of a high injunctive norm, as suggested by Rimal and Real (2003) and Rimal and Real (2005). This theoretical contribution is also suggested to apply to other behaviors beyond college alcohol use.

Hypothesis 2 predicted that gender would moderate the effect of perceived norms on heavy alcohol use and alcohol consequences. However, this hypothesis was not supported. Although a significant interaction was obtained, the direction of the moderation was opposite of the prediction. Specifically, the relationship between the perceived descriptive norm and heavy alcohol use was stronger for males than females. Hypothesis 2 was based on previous research showing that social norms marketing campaigns have been more effective for women than men (Carey et al, 2009; LaBrie, et al., 2010; Larimer et al., 2007; Neighbors, Lewis, et al., 2010). Despite the effect being in the incorrect direction, similar effects have been reported by previous research. O'Grady et al. (2011) reported the relationship between the perceived norm and alcohol use was stronger among men than women. Similarly, Yankelevitz, Mitchell and Zhang (2012) reported that the relationship between the perceived norm and alcohol use was significant for men r=.62 (p<.01) but not for women r=.30 (p=.077).

In reference to Hypothesis 3, contrary to the prediction, there was no difference in the predictive value of the perceived injunctive norm and perceived descriptive norm in explaining current and future heavy alcohol use. Consistent with the FTNC, behavior is best predicted when both norms are used and in agreement. As a result, health practitioners should not debate on whether to use a descriptive norm or injunctive norm in their social norms marketing campaign. From an applied perspective, both norms should always be used and aligned with one another.

Consistent with the prediction in Hypothesis 4, results showed that more proximal groups had a stronger relationship with self-reported attitudes and behavior than more distal groups. In analysis 4a and 4b, the perceived descriptive norm of CSU students was more strongly correlated with self-reported heavy alcohol use than was the perceived descriptive norm of CU Boulder or University of Wyoming students. This is an important finding because some social norms marketing campaigns resort to using pictures of "generic" college students. As a result, an effort should be made to use real college students who attend the school or at least use pictures in which the people look like they attend the school. For example, actors should be wearing clothes with the school logo and the picture should be taken on campus with familiar landmarks in the background.

When using real students in the pictures, one strategy is to screen for light drinkers or non-drinkers. If the students in the pictures are heavy drinkers there is concern that students will not take the campaign seriously and thus it will not be effective in reducing self-reported heavy alcohol use. One suggestion is to use pictures of students who have been graduated for at least four years. This will reduce the likelihood of the target audience identifying the students in the pictures as heavy drinkers. However, using pictures of current students on the posters is suggested to be the most effective. Aloise-Young and Zaleski (2014) conducted a successful social norm marketing campaign in reducing energy use in residence halls at a major state university. Pictures of current students were used in the posters modeling energy saving techniques. Although anecdotal, many students on campus had given compliments to the real students in the pictures of the campaign. Additionally, multiple posters in the residence halls were marked by other students with the first name of the real students written next to their

picture. It is suggested that students are more accepting of messages on posters when pictures of current students are used in the posters in comparison to stock photos of generic college students.

Hypothesis 4c showed that the perceived descriptive norm of one's own dorm is more strongly correlated with the perceived descriptive norm of other dorms. Consistent with Bourgeois and Bowen (2001), the perceived descriptive norm of students from their own dorm was more strongly correlated with self-reported alcohol use than the perceived descriptive norm of students from different dorms. It is suggested that first semester students strongly identify with their residence hall upon entering a new college environment. Hummer, LaBrie, and Pederson (2012) reported that connectedness to residence hall moderated the relationship between self-reported alcohol use and perceived norms of alcohol use on same floor of residence hall. The relationship between perceived norms and alcohol use was stronger for those who felt more connected to their residence hall. One possible strategy to increase residence hall identity is to let students choose their residence hall. Similarly, normative feedback specific to residence halls has been shown to be effective in reducing electricity consumption among residents (Aloise-Young & Zaleski, 2014). In conclusion, social norms marketing campaigns could increase their effectiveness by creating messages specific to each residence hall. Additionally, students who live in the residence halls are typically first-year students and sophomores who are also typically the most at risk for heavy alcohol use.

Hypothesis 4d showed that alcohol use attitudes from friends were more strongly correlated with heavy alcohol use than alcohol use attitudes from the typical student. More specifically, alcohol use attitudes of the typical student was not correlated with heavy alcohol use r=.002. This is somewhat concerning considering that many social norms marketing campaigns use perceived norms of the typical student. Instead of a message using language such as "the

typical student" it is suggested that a more beneficial message would be "the majority of students." The actual percentage of students who do the behavior (descriptive norm) and approve of the behavior (injunctive norm) should also be displayed. Pictures could show a photo of 3 or 4 students with one of them in Black and White demonstrating that they are a heavy drinker and the minority. The perception of attitudes from friends about alcohol use was significantly correlated with self-reported heavy alcohol use. While it is not possible to create individualized campaigns for different circles of peer groups, it is possible to create a social norms campaign with a slogan, "*If you don't believe the numbers, ask four friends.*" Having students' incorrect misperceptions of peer alcohol use be corrected by their own friends is suggested to be very effective.

Contrary to expectations, perceived norms for first-year students and seniors were both significantly correlated with heavy alcohol use and the strength of the correlations did not significantly differ in either fall or spring semesters. This is actually somewhat good news when considering the application to a social norms marketing campaign. A picture of a first-year student or a senior should be equally effective in reducing heavy alcohol use among first-year students. However, past research suggests that first-year students may mimic the behavior of seniors to gain social status because seniors have more social status than first-year students in the college environment (Brannon & Pilling, 2005). As a result, a picture of a senior is recommended.

A number of hypotheses were tested regarding changes in heavy alcohol use and norms from high school to spring semester. It was expected that perceived norms, alcohol use and future intentions would be highest in fall in comparison to spring and retrospective high school. Hypothesis 5a showed that alcohol use and the perceived descriptive norm were significantly

higher in retrospective high school than in the fall of college. This effect is opposite of the prediction and not consistent with previous research. One possible reason for this effect is that the high school measures were retrospective and participants might have been making errors when trying to estimate alcohol use and perceived norms from 3-6 months ago.

Hypothesis 5b predicted that among a sample of first-year students, quantity per event (FQU vs. SQU), frequency of binge drinking (FFQ vs. SFQ), frequency of being drunk (FDK vs. SDK), future alcohol use intentions (FAI vs. SAI), the perceived injunctive norm regarding CSU students (FIN vs. SIN) and perceived descriptive norm regarding CSU students (FDN vs. SDN) would all significantly decrease from fall to spring. However, only quantity of alcohol per event had a significant decrease from fall to spring. As a result, it was concluded that Hypothesis 5b was not supported. A total of three variables (frequency of being drunk, perceived injunctive norm and future intentions) were not significantly different from the fall to spring. It is suggested that large changes in perceived norms and alcohol use are possible in college, but it may take 3-4 years and not one semester. Northern Illinois University had a very successful social norms marketing campaign, but the changes were slow over a period of 10 years (Haines & Barker, 2003). Health practitioners designing social norms marketing campaigns must be aware that it is very difficult to change social norms surrounding college alcohol use, but it is possible. The effectiveness of a social norms marketing campaign can be increased by having a similar type of message and campaign implemented over multiple years.

Hypothesis 5c showed that the decrease in quantity per event from fall to spring interacted with retrospective high school alcohol use. Participants were split into a group of non-drinkers or drinkers based on their response to retrospective high school alcohol use. The non-drinking group in high school demonstrated a dramatic decrease in quantity per event from fall

(*M*=4.18) to spring (*M*=.80). Secondly, the drinking group in high school demonstrated a minor increase from fall (*M*=2.50) to spring (*M*=2.57). It is also worth noting that this interaction effect was large with a partial eta-squared of .50. It is suggested that drinkers in high school self-select into drinking environments when they get to college. This would suggest that their drinking should remain stable or possibly increase. However, the non-drinkers had a dramatic decrease in quantity per event from fall to spring. One possible reason for this effect is that their fall drinking may be consistent with their inaccurately high estimate of the descriptive norm. After being on campus for one semester their perceived descriptive norm might reduce to more accurate levels which would then influence quantity per event of alcohol use to decrease as well.

In reference to Hypothesis 6, perceived norms were not more predictive of heavy alcohol use in college than in high school. This was not expected and not consistent with previous research. This null effect might be the result of the high school measure being retrospective. Participants might have made an error when trying to recall perceived norms and alcohol use from 3-6 months prior.

Hypothesis 7 used exploratory variables to try to predict the spring perceived injunctive norm. The fall perceived descriptive norm and fall heavy alcohol use were the only significant predictors of the spring injunctive norm. Fall alcohol-related consequences, gender, year in school, personal attitude of alcohol use, parental attitude of alcohol use, residence hall and the gender x fall alcohol use interaction were not significant predictors of the spring perceived injunctive norm. Based on previous research we know that the perceived descriptive norm and alcohol use are correlated with the perceived injunctive norm. However, this longitudinal analysis does provide a small unique contribution to the literature in that the perceived descriptive norm and alcohol from the fall are significant predictors of the perceived injunctive

norm in the spring. It is suggested that future research continue to investigate the origins of the perceived injunctive norm, which are still largely unknown.

Hypothesis 8 used an exploratory analysis to predict the spring perceived descriptive norm. Results showed that the only significant predictor of the spring perceived descriptive norm beyond the fall perceived injunctive norm was one dummy coded residence hall. Previous research has found the perceived injunctive norm and perceived descriptive norm to be significantly correlated. However, this longitudinal analysis does provide a small unique contribution to the literature in that the fall perceived injunctive norm is a significant predictor of the spring perceived descriptive norm. It is suggested that future research investigate possible origins of the perceived descriptive norm and perceived injunctive norm.

Limitations

In the longitudinal analyses there were very few significant predictors of spring alcohol use (either heavy alcohol use or alcohol consequences) after controlling for fall heavy alcohol use. Fall heavy alcohol use and the covariates explained the majority of the variance in heavy spring alcohol use (R^2=.593). Similarly, fall heavy alcohol use and the covariates explained a large proportion of variance associated with spring alcohol consequences (R^2=.405). After accounting for these variables, the perceived injunctive norm did not explain any additional variance of spring heavy alcohol use beyond the perceived descriptive norm. However, even the descriptive norm was not a significant predictor of future alcohol use or consequences. The inability to replicate these relationships longitudinally is an important limitation of the present study.

Another limitation of the presentation study was that the fall and spring variables were not missing at random. An MCAR test was conducted twice, once for the fall and once for the

spring. For the fall survey, many students did not answer the questions regarding perceived norms of other dorms (33.6%). Instead of indicating, "don't know" many skipped the question. For the spring survey, many students did not answer the alcohol consequences questions (14.2%). Instead of indicating a response option of "no" for the alcohol consequences, participants were more likely to skip it. Attrition is also a concern for the longitudinal analyses. Out of the 713 participants from Fall 2008, a total of 465 participants completed the survey in Spring 2009 for a response rate of 65.2%. Of the 465 participants in spring, a total of 330 participants were matched to the fall participants. This results in a match rate of 71% out of 465 or a match rate of 46.3% out of 713. Retrospective high school alcohol use and perceived norms were significantly higher among leavers versus stayers in a MANOVA. The main hypothesis was cross-sectional and thus attrition was not a concern.

Another limitation was that the high school alcohol use measure was retrospective. Students in their first semester of college were asked to estimate their frequency of alcohol consumption in a typical month in their last year of high school. There is a concern that students did not remember their high school alcohol use and they estimated their high school alcohol use based off of their current alcohol use. A high correlation r=.73 between retrospective high school alcohol use and fall alcohol use does suggest that this is a possibility. Another concern was that frequency of alcohol use in a typical month was significantly higher in high school (FRA=2.01) than fall semester of college (FFA=1.79). Based on previous research, this seems highly unlikely. It seems plausible that a high drinking month was more salient to the participants when trying to think about how many times they drank in a typical month in their last year of high school.

During Fall 2008 and Spring 2009, a social norms marketing campaign was conducted on campus within the residence halls, which could have influenced heavy alcohol use and perceived norms among the participants. Interestingly, participants in the treatment condition had a significantly higher heavy alcohol use score than participants in the control condition in fall and spring. This most likely occurred because residence halls were not randomly assigned to receive the campaign. The campaign organizer assigned the highest drinking residence halls to the treatment condition. Means for the treatment and control residence halls were almost identical from the fall to spring, suggesting no change. As a result, the social norms campaign was not considered to be a threat to internal validity.

The present study has advanced our knowledge in the area of the relationship between perceived norms and heavy alcohol use applied to social norms marketing campaigns. These results suggest that social norms marketing campaigns aimed reduce heavy alcohol use among college students should include the injunctive norm, target males, use more proximal reference groups such as the student's own residence hall and avoid distal reference groups such as the typical university student. Secondly, when targeting students before they get to campus and during the first semester, non-drinkers in high school should be the focus. However, after the fall semester, students who drank in high school should be the focus. Future research should continue to search for possible factors that can predict the perceived injunctive norm and perceived descriptive norm longitudinally. Future research on college alcohol use should also include more investigation of alcohol-related consequences. Approximately 40% of college students are heavy drinkers and 80% of them mature out of heavy drinking when leave college (Demb & Campbell, 2009). Because such a large percentage of college students mature out of heavy alcohol use, the study of alcohol consequences could provide additional applied value.

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APPENDIX A

Table 18
Complete list of fall and spring variables

Item #	Survey Question
F1/S1	When you go to the movies, what candy or snack do you have to have?
F2/S2	If you could become a super hero, who would you be?
F3/S3	What song or band do you secretly jam out to that you would never admit to your friends?
F4/S4	What is your favorite topping for ice cream?
F5/S5	What are the last three digits of your personal phone number?
F6/S6	How many credits are you taking this semester?
F7/S7	How many hours each day do you typically spend on facebook and/or Myspace or other social networking sites?
S8	On how many of the last 7 days did you participate in vigorous exercise for at least 20 minutes or moderate exercise for at least 30 minutes?
F8/S9	Since the beginning of the semester, how many issues of the Collegian have your read?
F9/S10	Which of the following modules of "U Consider This" have you completed? (check all that apply)
F10/S11	In which of the following do you participate? (Check all that apply)
F11/S12	What GPA (4.0 scale) did you earn in high school?
F12/S13	What is your major?
F13/S14	Do you have a second major?
F14/S15	What is your second major?
F15/S16	During your last year of high school, how many times did you talk with your parents or guardians about alcohol use and its consequences?
F16/S17	During your last year of high school, how many times did you use alcohol in a typical month?
F17/S18	What percentage of your high school classmates approved of consuming five or more drinks with alcohol in a three to five hour period?
F18/S19	In a typical month, what percentage of your high school classmates consumed five or more drinks with alcohol in a three to give hour period, at once?
F19/S20	Since you came to CSU, how many times have you talked with your parents or guardians about alcohol use and its consequences?
F20/S21	How do you think of yourself in terms of your current alcohol use
F21/S22	Have you ever had alcohol to drink, more than just a few sips (wine,beer, hard liquor)?
F22/S23	What is your typical motivation for drinking alcohol?
F23/S24	When drinking alcohol, at what point do you stop drinking or limit how much you consume?
F24/S25	How frequently do you typically consume alcohol?

F25/S26	When you go out and socialize or party and drink alcohol, how much do you typically consume per event?
F26/S27	How many different times have you used alcohol in the past 30 days?
F27/S28	During the last 30 days, on how many days did you have five or more drinks with alcohol in a three to five hour per period?
F28/S29	How often do you typically consume alcohol in your residence hall?
F29/S30	What is the average number of drinks you have when consuming alcohol in your residence hall?
F30/S31	How often do you typically consume alcohol in a difference residence hall on campus?
F31/S32	What is the average number of drinks you have when consuming alcohol in another residence hall on campus?
F32/S33	How often do you typically consume alcohol in an off-campus residence?
F33/S34	What is the average number of drinks you have when consuming alcohol in an off-campus residence?
F34/S35	How often do you typically consume alcohol in an off-campus bar/restaurant?
F35/S36	What is the average number of drinks you have when consuming alcohol in an off-campus bar/restaurant?
F36/S37	At what age did you first get drunk?
F37/S38	How many times in the last 30 days did you get drunk?
F38/S39	When CSU freshmen go out and socialize or party and drink alcohol, how much do you think they typically consume per event? (A drink is defined as a 12oz. beer, 12 oz. Malt beverage, a 12 oz. wine cooler, 5 oz. glass of wine, a mixed drink or a shot of liquor.)
F39/S40	When CSU seniors go out and socialize or party and drink alcohol, how much do you think they typically consume per event? (A drink is defined as a 12oz. beer, 12 oz. Malt beverage, a 12 oz. wine cooler, 5 oz. glass of wine, a mixed drink or a shot of liquor.)
F40/S41	How frequently do you think CSU freshmen typically consume alcohol?
F41/S42	How frequently do you think CSU seniors typically consume alcohol?
F42/S43	How many different times do you think the typical CSU freshman has used alcohol in the past 30 days?
F43/S44	How many different times do you thinkt he typical CSU senior has used alcohol in the past 30 days?
F44/S45	During the last 30 days, how often do you think CSU freshmen typically got drunk?
F45/S46	During the last 30 days, how often do you think CSU seniors typically got drunk?
F46/S47	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? - Academic Village
F47/S48	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Allison

F48/S49	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Braiden
F49/S50	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Corbett
F50/S51	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Durward
F51/S52	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Edwards
F52/S53	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Ingersoll
F53/S54	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Newsom
F54/S55	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Parmelee
F55/S56	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Summit
F56/S57	During the last 30 days, what percentage of students living in the following residence halls do you think have consumed five or more drinks with alcohol in a three to five hour period? – Westfall
F57/S58	What percentage of CSU students do you think approve of consuming five or more drinks with alcohol in a three to five hour period.
F58/S59	Overall, what percentage of CSU students do you think consume five or more drinks with alcohol in a three to five hour period during a typical month?
F59/S60	What percentage of University of Wyoming students do you think consume five or more drinks with alcohol in a three to five hour period during a typical month?
F60/S61	What percentage of University of Colorado students do you think consume five or more drinks with alcohol in a three to five hour period during a typical month?
F61/S62	In Fort Collins, if you wanted to get alcohol how easy would it be for you to get some at a local bar or restaurant?
F62/S63	In Fort Collins, if you wanted to get alcohol how easy would it be for you to get some at a local liquor store?
F63/S64	Have you consumed alcohol this past semester?
F64/S65	During this semester, if you were drinking alcohol, how often did you…Alternate non-alcoholic with alcoholic beverages

F65/S66	During this semester, if you were drinking alcohol, how often did you…Choose not to drink alcohol
F66/S67	During this semester, if you were drinking alcohol, how often did you…Use a designated driver
F67/S68	During this semester, if you were drinking alcohol, how often did you…Eat before and/or during drinking alcohol
F68/S69	During this semester, if you were drinking alcohol, how often did you…Stay with the same group of friends while drinking alcohol
F69/S70	During this semester, if you were drinking alcohol, how often did you…Keep track of how many drinks you were having
F70/S71	During this semester, if you were drinking alcohol, how often did you…Avoid drinking games
F71/S72	During this semester, if you were drinking alcohol, how often did you…Determine in advance not to exceed a set number of drinks
F72/S73	During this semester, if you were drinking alcohol, how often did you…Consume only one type of alcohol (e.g. beer, wine, a mixed drink)
F73/S74	During this semester, if you were drinking alcohol, how often did you…Have a friend tell you when you've had enough
F74/S75	During this semester, if you were drinking alcohol, how often did you… Stay in one place while drinking
F75/S76	During this semester, if you were drinking alcohol, how often did you…Pace your drinks to 1 or fewer per hour
F76/S77	During this semester, if you were drinking alcohol, how often did you…Choose a drink for its low percentage of alcohol (e.g. 3.2 beer, mixed drink with only shot)
F77/S78	During this semester, if you were drinking alcohol, how often did you…Drink an alcohol look-alike (e.g. non-alcoholic beer, punch)
F78/S79	Within this semester, have you ever experienced the following situations as a consequence of using alcohol? - passed out from drinking too much
F79/S80	Within this semester, have you ever experienced the following situations as a consequence of using alcohol? - forgotten where you were or what you did
F80/S81	Within this semester, have you ever experienced the following situations as a consequence of using alcohol? - gotten sick and vomited from drinking too much
F81/S82	Within this semester, have you ever experienced the following situations as a consequence of using alcohol? - done something you later regretted
F82/S83	Within this semester, have you ever experienced the following situations as a consequence of using alcohol? - missed a class
F83/S84	Have you consumed alcohol in the last 30 days?
F84/S85	During the last 30 days, on how many occasions did you drive a car after drinking alcohol?
F85/S86	During the last 30 days, on how many occasions were you the passenger in a car with a driver who had been drinking?
F86/S87	Which attitude best represents you?"
F87/S88	Which attitude best represents your parents?"

F88/S89	Which attitude best represents your closest friends?"
F89/S90	Which attitude best represents the students living in your residence hall?
F90/S91	Which attitude best represents a typical CSU student?
F91/S92	The following questions contain a number of statements about possible effects of alcohol. Please indicate your level of agreement based on how you think alcohol would affect you even if you don't drink. – I would fit in with my peers
F92/S93	The following questions contain a number of statements about possible effects of alcohol. Please indicate your level of agreement based on how you think alcohol would affect you even if you don't drink. – I would have a better social life than if I weren't drinking.
F93/S94	The following questions contain a number of statements about possible effects of alcohol. Please indicate your level of agreement based on how you think alcohol would affect you even if you don't drink. – I would feel less stressed.
F94/S95	How much do you think people risk harming themselves (physically or otherwise" if they use alcohol regularly?
F95/S96	How much do you think people risk harming themselves (physically or otherwise) if they regularly consume enough alcohol to get drunk (slurred speech, loss of motor skills, memory loss)?
F96/S97	How upset would your parents be if they found out that you recently had drinks with alcohol?
F97/S98	How upset would you parents be if they found out that you had recently gotten drunk?
F98/S99	How upset would your parents be if they found out that you had recently driven a car after drinking?
F99/S100	Since the beginning of the semester, how often have your friends asked you to…Drink Alcohol
F100/S101	Since the beginning of the semester, how often have your friends asked you to…Get drunk
F101/S102	Since the beginning of the semester, how often have your friends asked you to…Ride with a driver who had been drinking
F102/S103	What percentage of CSU freshmen do you think typically abstain for drinking alcohol?
F103/S104	What percentage of CSU freshmen do you think drink alcohol once a week or less?
F104/S105	What percentage of CSU freshmen do you think typically consume 4 drinks or less when they drink alcohol? (A drink is defined as a 12oz. beer, 12 oz. Malt beverage, a 12 oz. wine cooler, 5 oz. glass of wine, a mixed drink or a shot of liquor.)
S106	Please indicate your level of agreement with the following statement: The typical student believes that drinking alcohol once a week or less is the right thing to do.

S107	Please indicate your level of agreement with the following statement: The typical CSU student believes that drinking 4 or less drinks per event is the right thing to do.
F105/S108	In the past 30 days, how many CSU freshmen do you think have driven a car after drinking alcohol?
F106/S109	How often would you try to stop your friends from driving after they had been drinking?
F107/S110	How do you think your alcohol use will change or not change over the next year? I think that the number of days/months that I have drinks with alcohol will…
F108/S111	How do you think your alcohol use will change or not change over the next year? I think that the number of drinks I have each time I drink will…
F109/S112	If a friend offered you a drink with alcohol and you didn't want it, how sure are you that you could say no?
F110/S113	How old are you?
F111/S114	What is your gender?
F112/S115	How do you identify ethnically/racially?
F113/F116	Do you pay in-state or out-of-state tuition?
F114/S117	Are you a first generation college student (neither your parents attended college)
F115/S118	For which of the following types of financial aid are you eligible?
F116/S119	How much does your family contribute to your educational experience (e.g. tuition, fees, books)?
F117/S120	How much does your family contribute to your other (non-school) expenses (e.g. living expenses, rent, food, spending money)?
F118/S121	As of this semester, what is your class standing?
F119/S122	In which residence hall do you live?
F120/S123	Which residence hall was your first preference?
F121/S124	Think about the hall that was your first preference; why was it your first choice? (Check all that apply)
F122/S125	In which type of room do you currently reside?
F123/S126	What is the gender of your floor in the residence hall?
F124/S127	Did you choose your roommate(s)?
F125/S128	Did you live in Larimer County and/or within 25 miles of CSU before coming to CSU?
F126/F129	Have you seen the image below?
F127/F130	Have you seen the image below?
F128/S131	How believable is the message in the poster above?
F129/S132	Have you seen the image below?
F130/S133	How believable is the message in the poster above?
F131/S134	Have you seen the image below?
F132/S135	How believable is the message in the poster above?
F133/S136	Have you seen the image below?
F134/S137	How believable is the message in the poster above?
F135/S138	Have you seen the image below?
F136/S139	Have you seen the above image below?

F137/S140	Please indicate your level of agreement with the following statements: - This ad encouraged me to consider the consequences of my actions.
F138/S141	Please indicate your level of agreement with the following statements: - This ad provides important information for CSU students to know.
F139/S142	What percentage of students, living in your residence hall, do you think have a Balance Your Life, Your Future poster in their room?
F140/S143	What percentage of students, lving in other residence halls, do you think have a Balance Your Life, Your Future poster in their room?
F141/S144	Please indicate your level of agreement with the following statement: I think the information on the Balance your Life, Your Future poster campaign is worth sharing with other students.
F142/S145	Of those posters in students' rooms, what percentage do you think were vandalized and joked about?
F143/S146	Of those posters in students' rooms, what percentage do you think were ignored?
F144/S147	Of those posters in students' rooms, what percentage do you think were taken seriously and discussed?
F145/S148	Please indicate your level of agreement with the following statement: The typical student believes that drinking alcohol once a week or less is the right thing to do.
F146/S149	Please indicate your level of agreement with the following statement: The typical CSU student believes that drinking 4 or less drinks per event is the right thing to do.
F147/S150	How often in recent months have you seen or heard these messages on bulletin boards?
F148/S151	How often in recent months have you seen or heard the above messages on… - Flyers
F149/F152	How often in recent months have you seen or heard the above messages on… - Posters
F150/S153	How often in recent months have you seen or heard the above messages on… - T-shirts
F151/S154	How often in recent months have you seen or heard the above messages on… - CSU Newspaper
F152/S155	How often in recent months have you seen or heard the above messages on… - Cups
F153/S156	How often in recent months have you seen or heard the above messages on… - Other people's dorm rooms